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Metals Review

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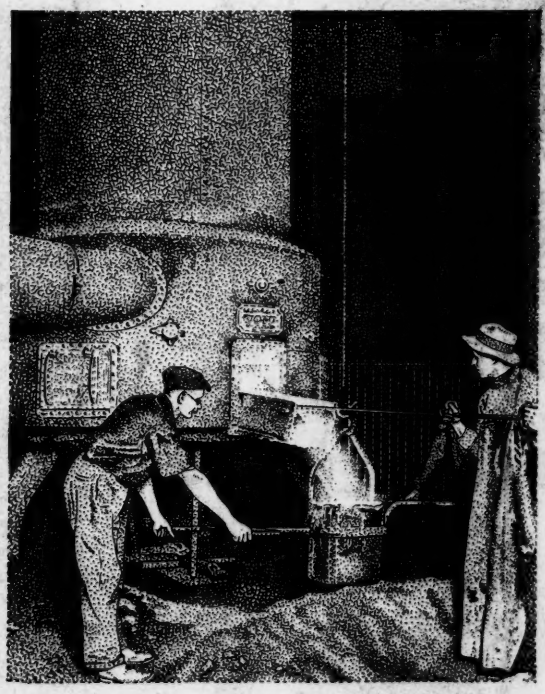
FOUNDRY PRACTICE AND SUPPLIES



NOTABLE LECTURES

Reported This Month

Donald Reese predicts cast iron with 200,000-psi. tensile as a modern engineering material . . . R. A. Clark explains importance of graphite flake size and distribution in controlling strength of cast iron . . . Kenneth L. Clark lists important wartime developments in foundry technology . . . Arnold Rose describes physical and chemical properties required of various metals for vacuum tube applications in televised meeting at York . . . Jeffries tells how tungsten has been responsible for three revolutions in our technical life, and cites production figures in predicting future of metals . . . Swanson uses production control charts to regulate steelmaking operations.

Featuring

Foundry Practice

By H. W. Lownie, Jr.
Research Engineer, Process Metallurgy Div.
Battelle Memorial Institute

A critical appraisal of developments during the past year as reflected in the technical literature. Based on the "Review of Current Metal Literature".

Equipment and Supplies for the Foundry Industry

A resume of new products introduced and described by the manufacturers during the past 12 months to aid in the production of better castings by modern methods.

READ • CHECK • PASS ON

- ☐ Management
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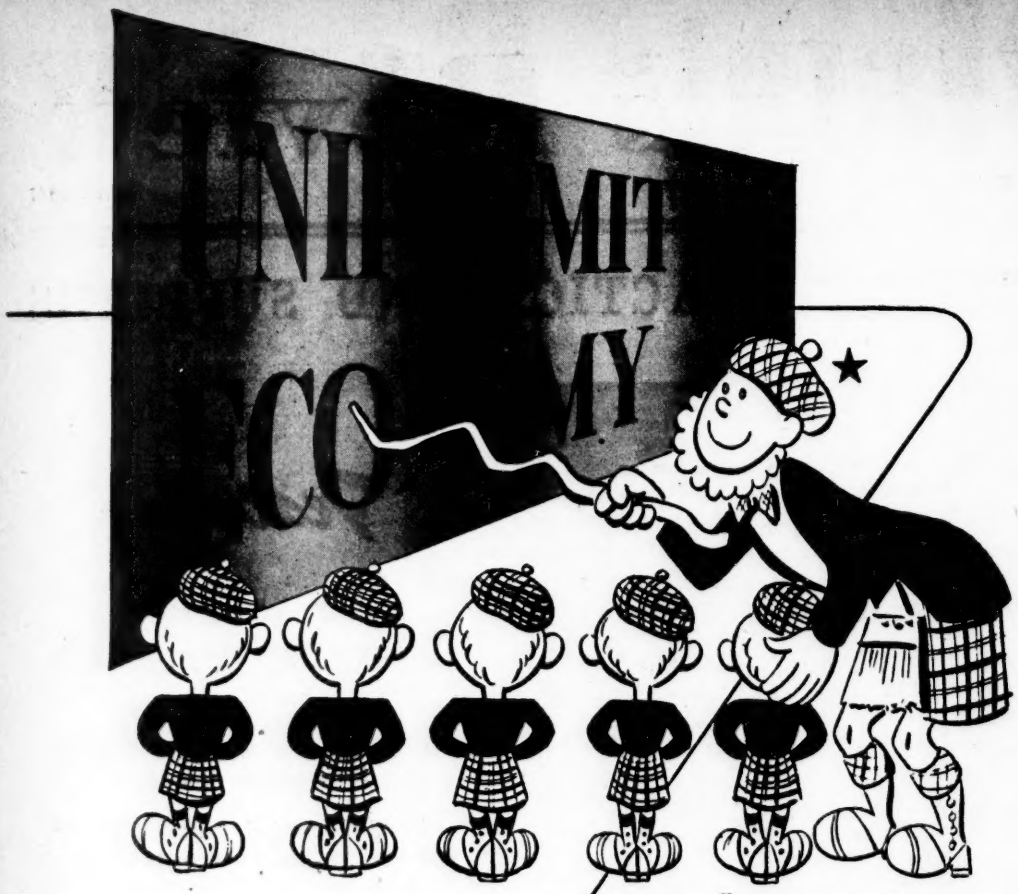
NEXT MONTH—TESTING AND INSPECTION



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Vol. XX, No. 4

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April 1947

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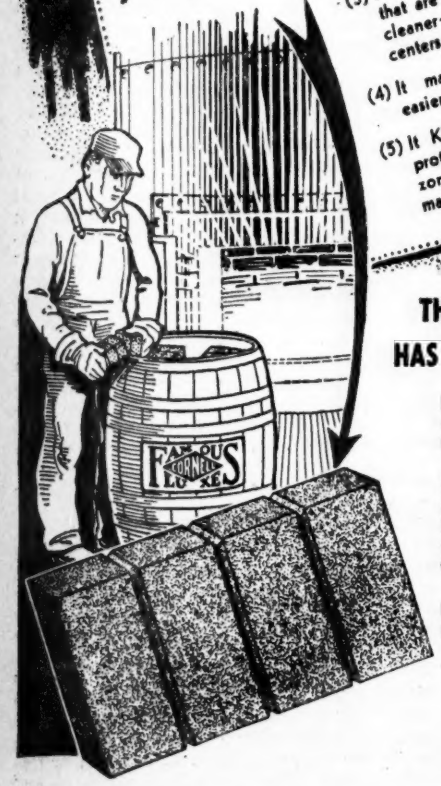

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Foundry Practice

Developments During the Past Year as Described in the Literature

By H. W. Lownie, Jr.
Research Engineer, Process Metallurgy Division
Battelle Memorial Institute

BECAUSE OF THE individual peculiarities of the many metals cast and the wide variety of casting weights, sections, and applications, developments in foundry practice have assumed several guises. In reviewing the progress of the past year, it is apparent that but little of the development has been along strictly metallurgical lines. The foundry "metallurgist" has become a jack-of-all-trades and has turned his abilities into channels that are sometimes quite remote from the usual definition of metallurgy.

Because of the diversity of foundry products, it is impossible to assign a ranking of relative importance to new developments. Indeed "new" developments may be either the proven products or processes resulting from a program of effort spread over a number of years or they may be freshman innovations still to be accepted or rejected on the basis of future years of practical application. The developments discussed below are those which seem to give greatest promise of gaining a permanent place in foundry practice.

Core and Sand Binders

During the war, urea resin synthetic binders proved outstandingly successful in light-metal founding. They were also applied on a limited scale to ferrous metal casting, but with little success because of their high collapsibility and low hot strength. Recently developed phenolic resin synthetic binders, however, are destined to become increasingly popular.

As synthesized, these synthetic resins are liquids, but for core-room use they are usually supplied as fine, dry, water-soluble powders. Oil binders (which are natural rather than synthetic products) all require air to set them. When an oil core is baked, air must penetrate to its center to "set" or oxidize the oil. This is a slow process when cores are large, and overbaking of the outside surface often occurs before the center of the core is completely baked. Thermosetting synthetic resins, on the other hand, set spontaneously on heating and require no air. Resin-bonded cores, therefore, bake more rapidly and more uniformly.

Gebhardt (14-68, March 1946)* describes the application of urea-formaldehyde synthetic resins for light-metal foundry practice. The binders are dispersed by tempering water in the sand and migrate toward the surface of the core in baking. As oven heat dries off the moisture, the resins are deposited from a concentrated solution, building up at the surface of the core into a dense, firm bond and leaving the center soft. When cured, the film is highly resistant to moisture absorption, is burned out easily by the heat of the metal, and the gas evolved on pouring is low. Additions of other materials can be made to the core-sand mixture to build up surface hardness, increase center strength, improve collapsibility, improve workability, or (for magnesium foundry work) to act as an inhibitor. Gebhardt also shows that heat applied with infrared lamps can be as effective as oven heat, and that temperatures as low as 250° F. can complete the reaction in these urea resins.

Development of the phenolic resin binders for iron foundry use has not yet reached publication stage, but laboratory and foundry trials have shown that these binders give high strengths comparable with those obtained with oils; they cure much faster than oils, especially in thick sections; their gas evolution is low; and they do not form obnoxious gases and smoke during baking and pouring. Their application in general practice appears to have a bright future.

Chemically coated molding sands began to receive attention in several laboratories about the end of 1945. They were originally heralded as "waterless" molding sands, but laboratory development resulted in several changes in composition, including the addition of a small amount of water. In January 1947, chemically coated sands were introduced into a well-known large gray iron production foundry on a trial basis and were greeted with enthusiasm. At this foundry, a single chemically coated sand is being used to produce castings weighing from 35 to 350 lb. Casting production is about 130 tons a day. Three additional foundries are scheduled to begin full-scale trials in April.

The material has so far been tried only as a green sand for the casting of gray iron. Extension to other types of molding and other metals can be expected as the material becomes more familiar. The first public description of this new process is expected to appear in the trade press in May.

The new coated sands combine low moisture content with high permeability. Moisture content is about half that of a normal synthetic sand on the same casting. In the production trials, cleaning time was cut in half, since the coated sand was found to adhere only loosely to the castings and did not burn in. Flowability of the sand during molding is said to be much higher than for the usual type of synthetic sand, and permissible mulling time is short.

Main disadvantages of the sand seem to be its high cost and increased generation of smoke at the shakeout. The relative merit and value of chemically coated sands as compared to more conventional sands will probably be established by actual use during the next year or two. At the present time, the development seems to warrant close attention.

The sand is a silica grain coated with a plastic. The coating is applied as a black liquid which consists of four main constituents: *(a)* a resin with a high-carbon-to-hydrogen ratio, *(b)* a solvent, *(c)* a catalyst to control combustion of the coating, and *(d)* an emulsifier or wetting agent which improves the compatibility of the various materials. The plastic coating burns entirely to gas at about 900° F. and leaves no residue. The coated sand is used repeatedly and the coating material is replenished by the foundry as it is gradually lost as a gas. Clay binders and other additions are made to the sand much in the same manner as for normal synthetic sand practice.

The British Iron and Steel Institute (14-268, Nov. 1946) announced the results of investigations on replacing linseed oil in core binders by aromatic extracts removed by solvents from the lubricating oil fraction of crude petroleum. These extracts are available in considerable quantity and are of uniform composition. It was found that, under various conditions, 40 to 50% of the linseed oil could be replaced with these extracts without change in strength or foundry properties. The findings were confirmed by trials in steel foundries.

Shaw (14-48, March 1946) presents a simplified method of preparing a stable, partially hydrolized, ethyl silicate from silicon ester. Such silicates are used as a binder for suitable aggregates. The setting time can be varied from 5 min. to 5 hr., depending upon the amount of water added and the concentration of condensing agents. The mixture of ethyl silicate and aggregate may be made up as a slurry or

*Literature references are designated by the corresponding item number in the Review of Current Metal Literature rather than by repeating the entire title, author and source; the reader can get this information by referring to *Metals Review* for the month indicated.

as a paste. Its advantages are *(a)* controlled setting, *(b)* refractoriness to about 2900° F., *(c)* dimensional constancy, *(d)* adequate and easily varied mechanical strength, and *(e)* easy stripping at the cold-set stage.

The main application of such binders has been in precision casting, but Shaw sees no insuperable obstacle to the use of semidry mixtures containing ethyl silicate for facings for large castings and slurries for coatings. The use of ethyl silicates also produces the high strength, high refractoriness, and resistance to thermal shock necessary for semipermanent split molds for low melting point metals in which the mold can be used for several castings. In a discussion of this process (14-55, March 1946), it was brought out that ethyl silicate molds have been used for casting gray iron. Experimental stainless steel castings had a finish that prompted a consumer to make an earnest plea for continuation of the development.

Dielectric Heating

The use of thermosetting synthetic resin binders in core mixtures has made it possible to develop dielectric baking for dry sand cores and molds. Calhoun, Clark, and Salzberg (14-213, Sept. 1946) compare dielectric heating with induction heating. Dielectric heating uses high-frequency alternating electrical fields and is applied to poor conductors, whereas induction heating uses high-frequency alternating magnetic fields and is applied only to good conductors. McElgin (*Foundry*, June 1946, p. 114) describes the application of 6000-volt dielectric heating equipment for baking cores at the radio frequency of 20 megacycles. With such equipment it was possible to bake completely the 1-in. square cross section of the standard A.F.A. tensile-test core specimen in 30 sec.

Wise and Moran (14-160, July 1946) point out the advantages of dielectric heating of cores and give examples of successful commercial installations. Heat is produced evenly throughout the cross section of the core and does not have to penetrate in from the surface as in oven baking. Sand cores are therefore baked evenly all the way through. The main advantage, however, of using dielectric heating in conjunction with thermosetting binders is the speed with which finished cores can be produced. Small cores can be baked in as little as 30 sec. and larger cores often require only a few minutes. The process is ideally adapted to production lines, since cores can be placed directly from the molding equipment onto a conveyer leading through an electronic heating tunnel. Heating is almost instantaneous, virtually no warm-up time is required, and heat is supplied only when needed.

The method is not applicable to drying cores bonded with the usual drying oils because of the higher temperatures required. Dielectric heating in continuous units is best suited to high-production cores rather than jobbing lots of assorted cores, although it can be installed on a batch-type basis for the latter purpose.

Harold W. Lownie, Jr., has been highly active in the committee work of the Gray Iron Division of the American Foundrymen's Association, and at Battelle is assigned to the broad development program of the Gray Iron Research Institute. Mr. Lownie holds a Master of Science degree in metallurgical engineering from the University of Pittsburgh. Before joining the Battelle staff in 1945, he was for six years associated with the Westinghouse Electric Corp. as a foundry engineer and materials engineer.

Increased Interest in Research

Foundry research has been greatly intensified during the past year, and foundry research staffs maintained by large corporations, research institutions, the United States Government, and cooperative associations have been augmented by new personnel and new equipment. An excellent and detailed review of activities at six large research laboratories has been published (14-207, 14-239, 14-270, 1945 volume;* 14-64, March 1946; 14-122, May 1946; 14-199, Aug. 1946). These and similar laboratories are playing an important part in the development of fundamental information which underlies most of the practical foundry developments.

At a time when the universal goal seems to be to build equipment that is "the largest in the world", it is noteworthy that research problems have resulted in the construction of some pieces of equipment which might be called the smallest in the world. Such equipment permits investigations which would be decidedly inconvenient on the normal commercial scale. A one-eighth-scale working model of a blast furnace was constructed for the British Iron and Steel Federation (16-13, 1945 volume). This furnace has a hearth diameter of 21 in. and is about 10 ft. high. It is well supplied with all the usual instruments and some special control devices. Charges consist of 15 lb. of coke, 20 to 25 lb. of ore (33% Fe), and 8 lb. of flux. Air is supplied at the rate of 200 cu.ft. per min. On a continuous blow of 13 weeks, this unit produced an average of 4 tons of pig iron a week.

The Gray Iron Research Institute, in this country, has developed a "baby" cupola for studying certain conditions of cupola melting ("Survey of Foundry Coke Characteristics." D. E. Krause and H. W. Lownie, Jr.; paper for 1947 convention of the American Foundrymen's Association, to be published in A.F.A. *Transactions*). Operating with an iron-to-coke ratio of 7½ to 1 and an air rate of 12½ lb. per min., this 10-in. diameter cupola melts at the rate of about 700 lb. of iron per hr., with tapping temperatures in the range of 2760 to 2820° F. Equipped with blast-humidity control, air-weight control, automatic CO_2 recorder, well electrodes for determining metal height in the well, and other more common instruments, this cupola is being operated in an attempt to bridge the gap between laboratory and commercial foundry.

Improved Working Conditions and Mechanization

On an industry-wide basis, foundries are awakening to the advantages resulting from improved working conditions. Using *The Foundry Is a Good Place to Work* as a motto, they are attacking the traditional stigmas frequently attached to foundry work. In the interests of cleanliness, safety, and better labor relationships, many foundries have learned that white paint is a worth-while investment.

Kane (14-60, March 1946) cites the advantages of exhaust ventilation at the source of dust or fumes as superior to general ventilation, and gives detailed methods of local ventilation. Thomson (14-36, March 1946) describes the use of a vacuum system to clean molds instead of blowing dirt all over the foundry with compressed air. A unique feature of Thomson's system is the installation of vacuum mains running the length of the foundry, with take-off connections at convenient points. The vacuum system is also used to remove shot from cleaned castings.

Schwenn (14-178, Aug. 1946) introduces the idea of "plant conditioning" and points out the advantages of a good exterior appearance of the foundry. He also presents detailed figures on the moderate financial expenditures necessary at one plant to eliminate many eyesores and accident hazards. Coupled with several carefully selected pieces of mechanical equipment, the improvements resulted in increased production at lower cost.

In a series of articles, Hermann (14-

*"1945 volume" represents Volume II, 1945, of the Review of Metal Literature, assembled and bound from the monthly installments published in *Metals Review* for that year.

121, May 1946 and 14-181, Aug. 1946) discusses improved methods for ventilation of shakeouts, the main source of foundry dust and fumes. A foundry is described where mold shakeout is fully housed; contaminated air is removed to a dust collector rather than blown into the outside atmosphere. The ventilation of pouring stations, sand-transfer points, and sand-cleaning stations is also explained.

Knight (14-120, May 1946) describes the steps in modernization of a foundry. Still another article (14-182, Aug. 1946) describes the increased production and better appearance in a nonferrous foundry obtained by improved lighting, layout, and dust control.

The advent of new and improved types of mechanical equipment has done much to increase production and, also, to improve working conditions. Allen (14-155, June 1946) describes the details of an automatic core-blowing and handling setup at an automotive foundry. This equipment more than tripled the man-hour output of 65-lb. cylinder barrel cores. Lyons (14-75, April 1946) reports an 80% increase in production at a nonferrous foundry when mechanical sand-handling equipment and conveyers were installed. The installation was effected in one week and required no additional floor space or personnel.

Considerable interest is being shown in sand reclamation systems. Such systems permit the use of more expensive sands and have numerous practical and financial advantages. Jeter (14-222, Sept. 1946) explains that the usual type of sand reclaiming system used in nonferrous foundries must be modified and expanded for use in ferrous foundries. Sands for ferrous foundries are more difficult to reclaim because of the accumulation of clay and oxidized oils on the sand grains. In the wet reclaiming method, sand is handled from the shakeout while suspended in water; it is dewatered, wet scrubbed, sized in a wet classifier, and the excess water removed by centrifuging. Water jets may be used to facilitate shakeout. In the dry method, the sand is handled dry from the shakeout, roasted at about 1400° F., cooled, dry scrubbed, and the fines removed by suction or dry classification.

Although the system is not yet in operation, plans were disclosed for the installation of a pipeline system in a large foundry to handle binders, clay, and similar powdered materials (*Foundry*, Jan. 1946, p. 124). Although stack or multiple molding is not new, another article (*Foundry*, April 1946, p. 126) announces a refinement of the method which elevates the product to the "untouched-by-human-hands" category. Movements of the machines and conveyers are timed and controlled electrically. All movements are actuated with hydraulic cylinders—the main cylinder exerting a pressure of 50 tons.

Sodium hydride descaling is described by Cady (7-133, July 1946). The article to be descaled is held in an open tank filled with a mixture of caustic soda and about 2% sodium hydride at about 700° F. The sodium hydride reduces the oxide in the scale and turns the hard clinging scale into a loose, flaky mass. This is blasted off by steam which forms when the hot casting is transferred from the hydride bath to a tank of cold water. Uniform descaling, elimination of metal loss by pickling, and elimination of the dangers of overpickling are practical advantages. Cady points out that at least 12 large-scale installations are now in commercial use. The process is being used in a large midwestern plant for the removal of sand and scale from gray iron oil-pump bodies and parts (7-111, June 1946).

A description of a core room without a foundry was presented by Ross (14-119, May 1946). Believed to be a new form of specialization, and well established after four years of operation, this concern produces up to 10,000 cores a day ranging in size from pin cores to complicated 100-lb. cores. These cores are shipped within a 200-mile radius to foundries which have no coremaking facilities of their own or which need to supplement their own production.

Of the many other examples of increased mechanization leading to better working conditions, the mechanization of a foundry for production of enameled sanitary-ware (14-298, Dec. 1946) and the conversion of a die-casting foundry to all-electric equipment for all melting and holding furnaces (14-232, Sept. 1946) are of interest.

Improved Riser Techniques

The "atmospheric head" or Williams riser was studied by Taylor and Rominski in 1942. Since that time, this type of riser and modifications of it have become increasingly popular. It is a blind riser in which a sand core admits atmospheric pressure to the partially solidified riser. Thus the reduction in pressure caused by contraction of the metal during solidification is counteracted. Graphite rods have also been used to some extent in blind risers for the same general purpose.

Jones (14-111, May 1946) describes the Washburn riser, which uses a relatively thin plate core that constricts the riser at the point of attachment to the casting. Cost of riser removal is minimized while the advantages of a heavy riser are retained, for the thin core heats quickly to a high temperature and insures feeding of the casting. Although the Washburn core is usually used with blind risers, Bradley (14-165, July 1946) also makes use of it for external risers and augments it with exothermic riser compounds.

"Gas pressure—exothermic" feeder heads were introduced during the past year in a British paper by Jazwinski and Finch (14-20 and 14-24, Feb. 1946). A mixture of a gas-producing compound and an exothermic compound is inserted into blind risers before pouring. Provision is made to delay the reaction of this mixture until after a thin skin of solidified metal has formed around the riser. The exothermic reaction then occurs to prolong the liquid interval of the metal in the head. At the same time gas is evolved which generates pressures of the order of 5 to 25 atmospheres in the head to force the liquid metal into the solidifying casting. Numerous startling examples are given of the efficacy of this method. Whereas a 60% yield is considered satisfactory in a steel foundry using gravity heads, 75 to 95% yield was obtained using the gas pressure heads. Sounder castings were also obtained.

A new exothermic material, available in granular form much like sand, is described by Lloyd (14-137, June 1946). It can be molded into core rings for use as feeding rings or can be mixed with facing material when desired. The exothermic cores are made up much in the same manner as dry sand cores and are usually molded into the head basins or riser necks. When hot metal contacts the core, an exothermic reaction is started and a considerable amount of heat is added to the metal in the riser, thus delaying solidification and permitting the head to feed metal to the casting over a longer period of time. The method has been successfully used to reduce shrinkage losses and porosity in a variety of metals including carbon steel, toolsteels, cast iron, copper-base alloys, and aluminum-base alloys. Using this method, rolls have been cast with wabblers on both ends, a practice not usually possible with previous techniques. Furthermore, metal yield is increased and cleaning costs reduced because the diameter of the feeding gate at the point it joins the casting is rarely more than 2 in., even when risers are 10 in. or more in diameter.

Although the use of liquefiers (which are sometimes mildly exothermic) on risers is now fairly common practice, Lutts, Hickey, and Bock (14-237, Oct. 1946) present a new method for making certain types of ferrous and nonferrous castings sound and free from shrinkage defects by using large amounts of exothermic powders in open risers. In both ferrous and nonferrous casting, the composition of the exothermic powder is adjusted so that the composition of the superheated metal produced matches that of the casting. Superheats of 1000 to 1500° F. above the usual pouring temperatures were obtained. Such exothermic mixtures as a source of superheated molten metal have been used as an emergency measure to produce steel castings directly by the familiar Thermit process (14-274, 1945 volume).

Solidification of Metals

In a condensation of his 1945 A.F.A. Foundation Lecture, Schwartz focused attention on the basic principles of metal solidification and heat transfer (14-184, 1945 volume). Study and application of these principles, he pointed out, have been grossly neglected by both the foundryman and the physicist. He discussed metal solidification under three general headings: *(a)* crystallization of solids from the liquid state, *(b)* thermal properties of the materials

involved, and *(c)* flow of heat through solids and liquids. Schwartz also presented a mathematical treatment indicating that the relation of metal frozen in a mold to the length of time involved cannot be satisfactorily explained if the thermal conductivity of molding sand is assumed to be independent of the temperature (14-366, 1945 volume). He likewise proposed that better correlation of data is obtained if heat transfer is assumed to be partially by radiation and partially by conduction.

The electric analogy method for the study of metal casting was first described by Paschkis (14-39, 1945 volume). In joint tests at the Naval Research Laboratory and Columbia University (14-6 and 14-7, Feb. 1946), experiments were conducted on the practical application of the electric analogy method to solidification studies. Rates of solidification of steel castings were determined by direct experiment by "slush casting" or "bleeding". The castings were poured and the flasks were overturned at selected time intervals after pouring. The solidified shells were sectioned and measured to determine the relationship between thickness of the solidified skin and time. Sand molds and chill molds were used in this work. From strictly thermal data, the electric analogy method was applied by building up an electric circuit to represent thermal conditions within the casting and adjacent mold materials. Electrical measurements were made and translated into heat terms. Relationships obtained between time and metal thickness by the electric analogy method were then compared with the result of direct experiment.

Fair agreement between the two methods indicates that electric analogy method is at least a possible tool for this work but that additional information must still be obtained on the thermal properties of the materials involved and on the problem of air-gap occurrence between the solidifying metal and the mold. These experiments are still in a preliminary stage.

Taylor and Wick did much to advance the knowledge of directional solidification of metals. Although their experiments were made on bronze castings, many of the principles involved are applicable to other metals. In a profusely illustrated article (14-113, May 1946), they show that directional solidification is an extremely important factor in the production of sound nonferrous castings. The major portion of nonferrous casting rejects, they believe, can be attributed to inadequate feeding rather than the many other variables often blamed. The over-all efficiency of risers can be greatly increased by insulation and by using insulating pads on thin sections when it is necessary to feed through them to reach heavier sections. Gypsum was found to be an efficient insulator, economical, and easy to fabricate into any desired shape. Gypsum powder is useful on the top of risers. These authors conclude that the interdendritic shrinkage of "G" bronze and the gross shrinkage of manganese bronze have a similar origin—lack of sufficient feeding—and can be overcome by proper control over the temperature gradients within the solidifying casting.

Mass Production of Precision Castings

Modern precision casting (or the "lost wax" process) has been the subject of intensive development since about 1938. Little was published on the subject until the end of the war, but then a virtual flood of publications appeared, and the general nature of the techniques involved and properties of the product are now generally known. Recent developments have taken two lines: *(a)* removal of the process from the laboratory stage to the mass-production stage for small castings, and *(b)* production of large castings with the precise dimensions and smooth finishes now common on small castings.

Announcement was recently made (14-154, June 1946) that during the war one precision casting plant produced a total of approximately 25,000,000 cast turbosupercharger buckets; peak output was 2,100,000 of these castings in one month. This plant also produced hundreds of thousands of ordnance parts, turbine blades, and compressor blades. All of these castings were made from alloys considered to be nonmachinable and nonforgeable. They varied in weight from 0.002 to about 3 or 5 lb.

With the end of the war, this plant has undertaken to adapt its high-speed process to a multitude of jobs of thousand-lot size instead of one job in million-lot quantities. Applications for which castings have been furnished in recent months include zipper slides, squirrel cages, canning-machine parts, rock drill pawls, diesel engine parts, spray-nozzle parts, and slides for cloth-cutting machines. The processes in use in this plant have been publicized in considerable detail (14-138, June 1946; 14-211, Sept. 1946; and 14-228, Sept. 1946), and, along with results obtained at many other plants under less spectacular conditions, definitely indicate that precision casting is steadily moving into full maturity as a modern fabrication process.

Although commercial production of precision castings of considerably larger size has not yet been publicized, laboratory production is receiving considerable attention.

Motion-Picture Photography

Fry (14-62, March 1946) presents a method of indirect radiography for observing the behavior of molten metal while being poured into molds. An X-ray tube is placed behind the mold and a fluorescent screen in front. As the casting is poured, the image of the mold on the screen is photographed with a motion-picture camera. One series of Fry's photographs compares the effects of slow and fast pouring through a bottom-pour gate and shows the severe turbulence resulting from fast pouring in the particular mold used. A second series shows the restraining action of "swan-neck" gates upon metal flow.

Still another series shows the effects of horizontal pouring; its portrayal of the actual development of internal shrinkage voids during the solidification of the casting is particularly interesting. The location of these voids demonstrates that the hottest metal in the casting is at the main point of delivery of metal and not at the immediate junction between the gate and the casting. These initial studies by Fry have brought to light many surprising phenomena which are to be investigated further. Additional work is also to be done on the technical details.

Cast Phenolic Resins for Patterns

Considerable interest has been shown in a method for producing matchplate patterns from liquid phenolic casting resins (14-300, Dec. 1946). Cast resin patterns have received considerable publicity previously, but these were for flat-backed or unmounted patterns. Phenolic cast resin patterns have a smooth, almost glossy surface which is hard and resistant to erosion by sand. They produce a smooth cast surface when used with suitable molding sands. They have the further advantage of being half as heavy as similar aluminum patterns. The process can be used to make high-production patterns in foundries which have no facilities for producing metal matchplates. Phenolic resin patterns are not affected by temperature or atmospheric changes in storage, do not absorb moisture, and are dimensionally stable. Although they have been used only on a limited scale so far, constantly increasing popularity can be anticipated.

Maintenance of Production

Problems encountered in individual foundries rather than on an industry-wide basis have been of paramount interest during the past year, because of reconversions from one metal to another, pig iron shortages, shortages of suitable personnel, coke shortages, and transportation interruptions. Such problems and their solution are not usually dignified by general publication—indeed, the problems are usually so pressing that no one has time to write about them when they occur, and no one wants to think of them when they are over—but, nevertheless, they have been a prime subject of "over-the-table" discussions between foundrymen. Exigencies have included changing from one type of fuel to another, producing iron castings without pig iron, operating with "tin-can" scrap, or operating with unskilled personnel. The nature of these problems has forced the foundryman to struggle to *maintain* the quality and production output of his product. It is reasonable to expect that when these problems become less pressing the foundryman will redouble his efforts to *improve* quality and to *increase* production, and thus to advance further the frontiers of the foundry industry.

EQUIPMENT AND PRODUCTS

for the Foundry Industry

Aids to Better Castings as Described by the Foundry Suppliers

IMPROVEMENT IN engineering properties of cast metal and ever-broadening applications of high-quality castings to intricate and unusual parts have been widely recorded by the producers of castings during the past year. Much of this information is of a specialized nature, and recommendations for individual problems can readily be secured from the principal producing companies. However, a general idea of some of the improved facilities and skills which have materialized in the production of heretofore "impossible" castings is reflected in several brochures currently being distributed.

One of these is a booklet by Howard Foundry Co. (R-381)* prepared for the purpose of promoting a broader understanding of the possibilities of casting as the answer to many metal forming problems. It deals with all of the procedures involved in casting aluminum, magnesium, bronze, brass and semi-steel, and illustrates many of the more intricate shapes which have been cast successfully by Howard. Convenient compilations of casting specifications, nominal compositions and mechanical properties are included.

Similarly, the sixth edition of "Facts for Foundrymen" by Ernest G. Jarvis and Herbert C. Jarvis has been announced by Niagara Falls Smelting & Refining Division (R-382). This little booklet is intended as a foundrymen's handbook and, though limited to the most commonly used alloys, it serves as an indication of the company's ability to manufacture alloy combinations new to the industrial and foundry world.

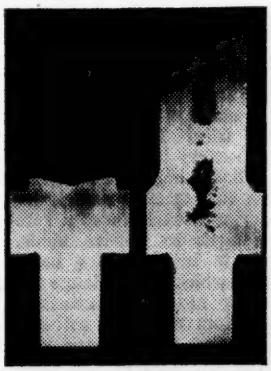
A new metal composition, still in the experimental stage, is under development by Detroit Gray Iron Foundry Co. (R-383). It is intended to withstand the wearing action on the end plates of tumble blasts, and with a slight variation can be adapted to die-casting nozzles and spacers. It withstands growth at the temperatures of zinc and aluminum die casting, and has a high density that makes it ideal for the tremendous pressures to which it is subjected.

In a new type of news bulletin Meehanite Metal Corp. is publishing a series of technical articles about latest developments in the engineering applications of Meehanite castings in industry (R-384). The first of these booklets describes the successful brazing of Meehanite to steel in a process recently developed by Continental Gin Co., Birmingham, Ala.

*Copies of bulletins or further information about the products described may be secured by using the Reader Service Coupon on page 53 specifying the appropriate R-number, or by writing direct to the manufacturer at the address given on page 47.

Feeding Compounds

New feeding materials and exothermic compounds for minimizing pipe and shrinkage porosity are prominent in the year's developments. A new approach to the old problem of risering is embodied in Risotherm, developed by Unexcelled Chemical Corp. (R-385). Not only do these compounds develop temperatures as high as 4000° F. in the riser when used as an anti-piping compound, but metal of the definite composition desired is deposited, together with an insulating slag layer to prevent heat loss to the atmosphere. The advantages in economy, casting soundness, and increased production are obvious from the photograph below, showing a sound casting at the left made with Risotherm and having a 90% yield; in the unsound casting at right, made without Risotherm, yield is only 55%.



Risotherm Makes Sound Castings

The casting is poured using open risers as in regular practice, the novel feature being that risers are poured extremely short. This insures that the intense heat developed will reach into the casting pipes where adverse temperature gradients can be corrected and directional solidifications established. Attempts to use previous exothermic materials with tall risers have failed because the effect of the heat was dissipated in the riser before it reached the casting, thereby allowing the riser neck to freeze in normal fashion.

Risotherm will control temperatures and composition of the metal deposited within strict and reproducible limits. Mixes can be made to fit the customer's requirements for plain and alloy, stainless and heat resistant irons and steels, as well as for alloys of nickel, copper or cobalt. Risotherm is made especially for use on risers, while Exocast is a source of molten metal for pouring special and emergency castings. Ladle-therm is available for making alloy additions to molten metal in ladles, and "Exo-weld" for "burning in" castings and for welding.

A new metal feeding compound for ferrous and nonferrous castings, known as Thermotomic X-235, is made by Pittsburgh Metals Purifying Corp. (R-386). It is produced in powder form, in consistency much like sand, and when mixed with water is molded into feeding ring cores or inserts and baked in the conventional manner. The compound raises the temperature of the cast metal, promoting better feeding into the mold and retarding solidification in those portions of the casting where rapid cooling may cause piping, shrinkage or segregation. Thermotomic X-235 differs from the company's regular Thermotomic compound in that it has a secondary exothermic reaction—having burned through once at 3000° F., it reacts and burns a second time at 3400 to 3600° F.

Exothermic ferrosilicon, first introduced in briquets by Chromium Mining & Smelting Corp., Ltd., is now offered in granular form (R-387). No. 145 Sil-X is used for chemistry in the ladle and for greater recoveries of silicon where low-silicon pig iron and larger quantities of steel scrap are used. No. 217 is used for promoting fluidity when temperature of the metal is low and thin sections are to be poured without preheating or washing of ladles. Both are designed to eliminate porosity.

An exothermic feeding compound developed by Foundry Services, Inc., and known as Foseco Feedol (R-213), was described in the February issue of *Metals Review*, in an article on production and properties of nonferrous metals.

National Smelting Co. has also developed three new products—NS-32, NS-35, and NS-66 refiners (R-388)—which add powerful grain-refining elements to aluminum alloys in addition to affording excellent cleaning action.

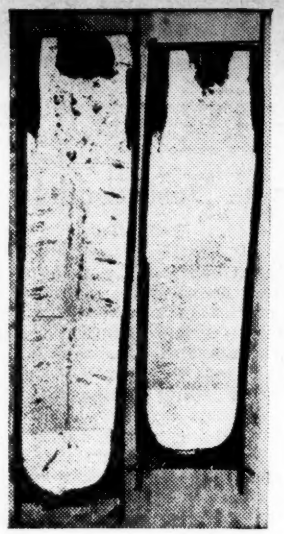
The grain-refining value of these products is deemed to be several times that of a pound of 5% titanium-aluminum alloy, as evidenced by the fact that additions of ¼ to ½ lb. per 100

lb. of aluminum generally suffice. Application is rapid and simple, and they are effective in decreasing shrinkage and hot shortness in both sand and permanent mold castings.

These refiners obviate the need for final cleaning agents, and eliminate the areas of varying grain size which cause shrinkage porosity at the juncture of the coarse-grained and fine-grained sections in the casting—a matter of great concern to foundries producing pressure-tight castings.

NS-32 and NS-35 refiners are essentially similar in their grain-refining and cleaning action. NS-35, however, adds titanium to the alloy, whereas NS-32 does not. NS-66 is used to give better filling in those applications where surface finish is of prime importance, where there is little or no machining involved, and where internal porosity is not under consideration.

A flushing process for molten steel expected to find wide use in foundries to minimize casting rejects caused by porosity has been developed by Air Reduction Sales Co. (R-390). The only equipment needed is a supply of dry nitrogen or argon and a special tube with which to introduce the gas in the form of small bubbles. Dissolved hydrogen—the cause of the pockets of porosity shown at the left of the illustration alongside—is eliminated efficiently and at reasonable cost—see the sound ingot illustrated at right.



Effects of Gas Flushing

Furnaces, Crucibles and Ladles

New melting furnaces for nonferrous alloys were described in the aforementioned article in the February issue of *Metals Review*. Not mentioned in that article, however, was a box-type crucible furnace developed by Alexander Saunders & Co. (R-391), specialists in precision casting equipment and supplies. This furnace, known as the Saunders No. 1M rectangular furnace, has two chambers each with separately hinged covers. The chambers are 10 in. long x 8 in. wide x 6½ in. deep and two No. 4 graphite crucibles may be used in each simultaneously.

Saunders No. 6 Melter

Two jets of flame enter each chamber from the burner nozzles in the walls. Gas and air are blended in Venturi mixers. Each chamber has its own controls in the gas and air lines and either chamber may be used as a single unit. Air pressure is required and the Leiman "D" blower unit is recommended for this furnace.

For small foundry work in nonferrous metals the Saunders No. 6 gas-fired melter (R-392) is of interest. This furnace, which will carry a No. 25 graphite crucible, has been modified to achieve greater compactness and simplicity of design. As a result the supply line from the motor-blower unit is shorter and has only one long sweeping 90° turn. High-temperature fireclay refractory is provided for the furnace cylinder and cover. A lift device permits easy opening and closing. The cylinder support includes a safety cup arrangement to receive spills. The cylinder is enclosed in a heavy steel jacket to which tuyere flange and built-in burner nozzle are attached. The flame enters near the bottom of the chamber on a tangent, and heat is directed to the lower part of the crucible and circulates around it. The Maxon Premix motor-blower unit is a high-speed free-air type of blower. Improved single-ratio valve insures properly proportioned mixture of gas and air regardless of volume of flame.

In the field of electric melting furnaces, Pittsburgh Lectromelt Furnace Corp. has made several improvements in design (R-393).

The standard Lectromelt furnaces of the larger capacities are now built with what is known as the four-point type of roof suspension. In the top-charge type of furnace the roof is raised hydraulically and swung to one side to permit charging of the furnace by means of a drop-bottom bucket. The entire roof ring and furnace structure are lifted and rotated. With the four-point type of roof suspension the roof ring and roof bricks are securely held in position without strain or without sagging. This results in increased roof life and also reduces maintenance on the furnace roof cooling rings. The roof rings themselves are now made in diameter greater than the furnace shell, which reduces cooling water requirements. The four-point suspension also reduces time for changing furnace roofs. The bezel ring around the top of the furnace is water cooled, further increasing roof life.

A further improvement is the use of power-operated electrode clamps or holders. The electrode is held in place by means of a spring-actuated mechanism, and this holding wedge is released by pneumatic pressure. Thus an electrode can be slipped in the holder from floor level without the necessity of climbing up on top of the hot furnace and manually removing and reinserting a holding wedge.

A new self-skimming crucible cover for nonferrous melting and pouring is being manufactured by Vesuvius Crucible Co. and sold by the S. Obermayer Co. (R-395). At the same time that it holds back dross or slag while pouring, permitting only clean metal to enter the molds, it also reduces the amount of fumes given off by the metal.

Skimming is accomplished by a graphite block suspended from the cover and allowed to hang down in the metal in front of the lip or pouring notch of the crucible. This block, by its method of suspension, is free to swing back and forth so that when the crucible is tilted, the skimmer block lies against the side of the crucible, leaving sufficient space between itself and the pouring notch to permit the metal to flow out, while, at the same time, holding back the slag.

Whiting Corp. (R-396) has introduced a new line of all-welded ladles said to incorporate longer life, greater safety and easier handling. Trunnions are welded to channel-shaped members which permit air circulation and eliminate eventual distortion of trunnion shafts. Self-aligning anti-friction type trunnion bearings are enclosed in shot and dirtproof housing and are also protected by shot guards. A new style gear bracket eliminates backlash, and turning the hand wheel operates a bell-crank which, in turn, motivates a reciprocating-type oil pump, forcing oil to bearings and other moving parts.

Refractory Materials

A special refractory jointing material that is rapidly supplanting fireclay and conventional high-temperature cements for laying up firebrick is known as Laclede Metaltite (R-397). This is a slag resisting, heat-setting mortar that is low in free silica and therefore resistant to slags containing molten metal oxides.

A unique feature of Metaltite is that, while it will outlast the brick it joins, its bond is easily broken when linings

must be torn out, so that any portion of the firebrick wall can be removed without the necessity of tearing down and rebuilding the entire structure.

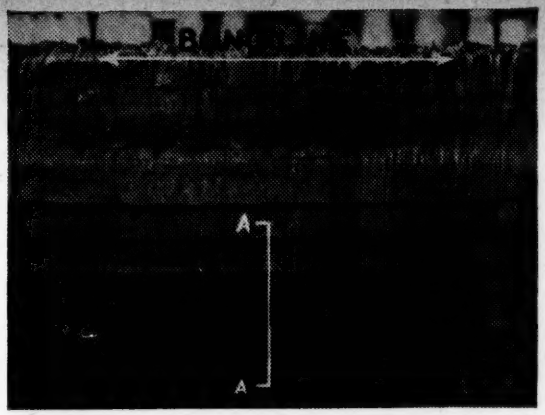
The photo alongside shows a portion of the sidewall of a malleable furnace. The ridges running horizontally through the wall are Metaltite joints, and it will be seen that while the brick are severely eroded, the joints remain intact. The section sketch indicates the extent of firebrick erosion as compared to the joints.

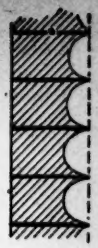
Metaltite increases operating efficiency and reduces maintenance costs where previously either fireclay or high-temperature cements were used. Whereas high-temperature cements are expensive and frequently bond the brick too tightly, fireclay, while low in first cost, is quickly attacked by heat, slag and molten metal, resulting in vitrification, spalling and the possibility of brick inclusions in the metal.

Applications for Laclede Metaltite include combustion chamber walls and top checkers in blast furnace stoves, cupolas, ladles, hot metal mixers, hot tops, pipe welding furnaces, transfer cars, continuous weld furnaces, air furnaces and electric furnaces.

A new item in the repertory of Brickseal Refractory Co. is Vango refractory coating for pouring ladles, crucibles, sand molds and cores, and high-temperature kilns (R-398). It is effective between 1500 and 3600° F. Vango forms a dense, hard, protective ceramic coating over the entire refractory lining and is equally effective for all types of firebrick, cast refractory or plastic. It penetrates and seals the pores of refractory linings, forming an impenetrable surface which completely stops infiltration of gases and carbon. It is not materially affected by sudden temperature change, thus eliminating spalling and cracking. It is a rugged binder for old, cracked, and loosened firebrick.

Vango refractory coating can be easily applied by spray gun or ordinary paint brush, and the unit fired immediately following the application. It is highly resistant to gases, acids, or alkalis and will not crack, peel or blister when exposed to rapid changes in temperature.





SECTION A-A

Section of Furnace Wall Made With Metaltite Joints

Casting Equipment

Much new mechanical equipment for die casting, centrifugal and precision casting has been introduced during recent months, and a section of the article in the February issue of *Metals Review* described several new die-casting machines. A unit publicized since that date is a compact, medium-sized, gooseneck machine manufactured by Robert A. Cox Co. and distributed by the Ermac Co. (R-400). This machine measures 22 x 72 in. and 40 in. high; it can be operated by the average shop employee and requires no special maintenance crew or operating technician.

In construction the Cox die-casting unit features single hook-ups for air, gas and 110-volt electrical current. It is furnished with blow torches for heating gooseneck and nozzle. Standard equipment also includes pyrometer, holding furnace and Venturi-type gas burner. The holding pot has a capacity of 300 lb. of zinc alloy. Simple operation throughout is an outstanding characteristic. The machine is equipped with a loose nozzle, instantly removable. A removable bar facilitates die loading. All working parts are readily accessible for maintenance.

Centrifugal Casting

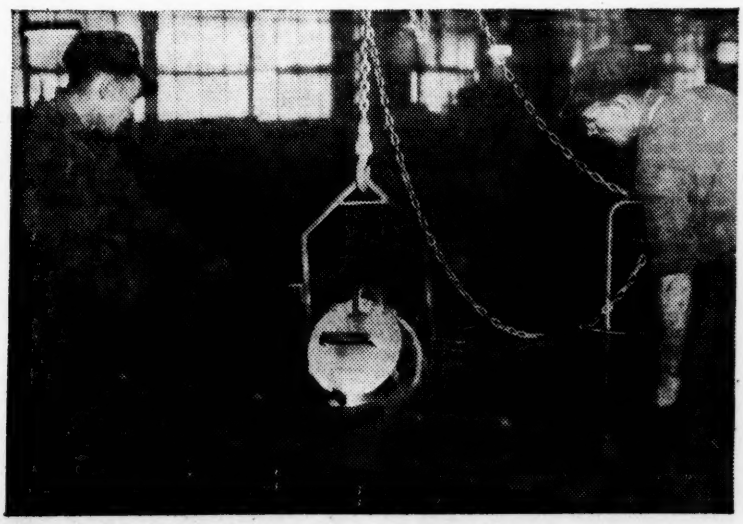
A centrifugal casting machine recently designed and built by Centrifugal Casting Machine Co. for production of welding rods can also be used for other types of centrifugal casting (R-401). While the production rate of the machine can be varied and is determined by the size of rod produced, as high as 1500 lb. per hr. of finished rods has been cast. The rods require no sandblasting or other type of cleaning. Rejection losses are negligible.

The machine, which is illustrated on page 14, has six individual casting machines or spindles mounted on one turntable which automatically brings each spindle in turn to the pouring station, the casting removal station, and the mold preparation station. The turntable is approximately 14 ft. in diameter, and is rotated by means of a chain drive, through a reduction gear and variable speed motor unit. The speed of the turntable may be varied from ½ to 2 r.p.m., thus adapting itself to the speed at which the various casting operations can be performed.

The turntable drive mechanism is provided with controls so that each spindle in turn is stopped at its proper station for the various operations. The table stops at each 60°, remains stationary for a predetermined period of time, and then moves on to the next stop. It is possible, however, to adjust the controls so that the turntable will rotate continuously at a desired rate of speed. Such a procedure is desirable for certain types of castings.

Each of the six spindles is equipped with a separate 5-hp. electronically controlled variable speed driving unit, having a continuously variable speed range from zero to 600 r.p.m. Each spindle comes up to speed immediately before reaching the pouring position,

(Turn to page 14)



Use of Self-Skimming Crucible Cover for Nonferrous Pouring

A.S.M. Review of Current Metal Literature

An Annotated Survey of Engineering, Scientific and Industrial Journals and Books Here and Abroad, Received in the Library of Battelle Memorial Institute, Columbus, Ohio, During the Past Month

1 ORES & RAW MATERIALS Production; Beneficiation

1-33. The Dressing of Iron Ores. F. B. Michell. *Mine & Quarry Engineering*, v. 13, Feb. 1947, p. 45-53.

Types of ore and methods of treatment. Illustrated by examples from practice involving different types of flow sheet. 12 ref.

1-34. Washing Plant for Total Run of Mine Ore at Rand Leases (Vogelstruisfontein) Gold Mining Company, Limited. M. J. Dennery and F. Wartenweiler. *Journal of the Chemical, Metallurgical and Mining Society of South Africa*, v. 47, Oct. 1946, p. 147-150; discussion, p. 150-153.

Flow sheet and operating data.

1-35. Engineering Problems in the Preparation of Ores for Blast Furnaces. D. C. Hendry. *Journal of the Iron and Steel Institute*, v. 155, Jan. 1947, p. 121-135.

Difficulties encountered in the crushing, screening, and blending of ores for the blast furnace, with particular reference to certain English ores; types of equipment in use for these operations; advantages and disadvantages of each type and precautions necessary to insure smooth operation. Normal sinter plant layout and equipment discussed critically. Ore preparation plant of the Hütte Braunschweig, Germany.

1-36. The Latest Development in Ore Dressing. S. R. Zimmerley. *Mining Congress Journal*, v. 33, Feb. 1947, p. 39-42.

New methods of concentration applied to low-grade materials and heavy media methods; Humphreys' spiral classifier; selective media concentrator; hydraulic constriction plate-type classifier; automatic controls for grinding and classification; Knoop hardness tester for small sizes; improved separation in flotation induced by heating; dry concentration by preferential attrition grinding and air classification; new uses of SO_2 for metallurgical purposes; ion-exchange resins for recovery of metals from solutions.

1-37. The Coal Field and Iron Deposits of Mexico. *Inter-American Development Commission.* 29 p.

Summary of these deposits insofar as they have been mapped.

1-38. Direct Reduction of Oxide and Silicon Dioxide Nickel-Cobalt Ores. D. P. Bogatsky. *Bulletin of the Academy of Sciences of U.S.S.R.*, Section of Technical Sciences, no. 12, 1946, p. 1809-1822. (In Russian.)

Contrary to established opinion, it is shown that low-grade and tailings-dump oxide and silicon dioxide nickel-cobalt ores may be treated by a new method of direct induction. The method and results of its application.

1-39. Making Tin Flotation Work—No. 4, San Jose Ore. A. M. Gaudin and R. T. Hukki. *Engineering and Mining Journal*, v. 148, March 1947, p. 70-72.

Results of a laboratory investigation which resulted in development of a proposed flow sheet for ore containing 1.39% Sn, 6.1 oz. Ag; 23.6% Fe; and 31.5% silica.

For additional annotations indexed in other sections, see:
26-38-41-43.

2 SMELTING AND REFINING

2-22. Ductile Melted Molybdenum. *Metal Industry*, v. 70, Feb. 7, 1947, p. 106, 113.

Production by the vacuum-arc method. Mechanical properties of cast ductile molybdenum.

2-23. Dephosphorized Bessemer Steel. G. M. Yocom. *Metal Progress*, v. 51, Feb. 1947, p. 243-247.

Development of a practice for dephosphorizing bessemer steel by blowing it hot, holding back the slag in the vessel by a temporary wood-block dam and adding the ingredients of a dephosphorizing slag to the stream of metal as it is poured into the ladle. Such a steel has different qualities from an openhearth steel of the same nominal analysis, and this fits it for certain applications such as flat-rolled products, rods and wire.

2-24. Nonferrous Metals. John L. Everhart. *Metals Review*, v. 20, Feb. 1947, p. 5-7.

1946 developments in production and properties, excluding the light metals; superalloys for high-temperature service; copper alloys; other nonferrous alloys; powder metallurgy.

2-25. Technology of Aluminum and Magnesium. L. W. Eastwood. *Metals Review*, v. 20, Feb. 1947, p. 7-8, 51.

Advances reported during 1946 in production and properties.

2-26. Products and Processes for the Nonferrous Industry. *Metals Review*, v. 20, Feb. 1947, p. 9-11, 14-15, 17.

New production equipment and improved compositions, as described by the manufacturers.

2-27. Some Economics of Blast Furnace Operation. James Dale. *Blast Furnace and Steel Plant*, v. 35, Feb. 1947, p. 220-223.

Variations in the characteristics of the coke, the ore, and the limestone, used as raw materials. How increased attention to testing these materials and to the setting up of price differentials for quality variations can save money for the industry. (Abstracted from paper read before the Cleveland Society of Engineers at Middlesborough England.)

2-28. Thermal Requirements for Blast Furnace Operation. Charles E. Agnew. *Steel*, v. 120, March 3, 1947, p. 130-132, 166, 168.

Operating practice at blast furnaces burdened on raw materials peculiar to eastern, southern, and northern districts. (To be continued.)

2-29. Ingot Mold Usage. N. H. Bacon. *Iron and Steel*, v. 20, Feb. 1947, p. 55-58.

The value of statistical methods in its study. (To be concluded.)

2-30. Basic Openhearth Slags. Part I. K. L. Fetters and E. W. Mahaney. *Iron Age*, v. 159, March 6, 1947, p. 62-66.

Chemistry, mineralogy, control, and operating significance of various slags.

2-31. The Manufacture of Steel in the Acid Openhearth Furnace by the Scrap-Carbon Process. B. Yaneske. *Journal of the Iron and Steel Institute*, v. 155, Jan. 1947, p. 24-26.

Indian scrap-carbon process using 100% steel scrap in which petroleum coke replaces carbon and acid slag replaces silicon. The hearth is protected from erosion by spreading an easily fusible silica sand over the banks before charging and manganese ore is used instead of iron ore for oxidizing the carbon. The quality of the nickel-chromium steel made by this process is claimed to be as high as that obtained by the pig-and-scrap process and yields are said to be higher.

2-32. First Report of the Side-Blown Converter Practice Subcommittee of the Steel Castings Research Committee. *Journal of the Iron and Steel Institute*, v. 155, Jan. 1947, p. 33-50.

Varying design and operating technique have been studied with regard to the various factors involved. The acid side-blown process and the acid openhearth process appear to be markedly similar with respect to reactions involved, properties of resulting steels, and thermal efficiency.

2-33. Thermal Requirements for Blast Furnace Operation. Part II. Charles E. Agnew. *Steel*, v. 120, March 10, 1947, p. 106, 109-110, 112.

Factor for determining amount of heat consumed in reduction of iron from the silicate is computed. (To be continued.)

2-34. Prospects for the Use of Oxygen in Blast Furnaces. I. P. Bardin. *Bulletin of the Academy of Sciences of U.S.S.R.*, Section of Technical Sciences, no. 10, 1946, p. 1385-1399. (In Russian.)

A short historical review emphasizes the importance of systematic research on the application of the oxygen blast in the iron industry. Some of the technical problems involved; diagrams and charts.

2-35. Experiments of Steel Production Using Oxygen Blast in a Bessemer Converter at the Stalin-Kusnetzky Plant. V. V. Kondakov. *Bulletin of the Academy of Sciences of U.S.S.R.*, Section of Technical Sciences, no. 10, 1946, p. 1401-1420. (In Russian.)

Experiments prove the applicability of the process to low-silicon pig irons. The steel obtained had improved mechanical properties, a low nitrogen content, and a very good microstructure. Consumption of oxygen was 40 cu. m. per ton, which corresponds to the theoretical value. However, the converters must be redesigned and adapted to the higher temperature of smelting.

2-36. Molecular State of Openhearth Slags and Distribution of Oxygen and Sulphur in the System Metal-Slag. A. S. Heinman. *Bulletin of the Academy of Sciences of U.S.S.R.*, Section of Technical Sciences, no. 10, 1946, p. 1439-1457. (In Russian.)

A general qualitative picture of the molecular structure of simple silicon melts of openhearth slags. On the basis of the data obtained, the distribution of sulphur and oxygen between basic openhearth slags and metal is calculated. 34 ref.

2-37. Heat Transfer in a Liquid Bath Stirred by Gas Bubbles. M. A. Glinkov and V. S. Kocho. *Bulletin of the Academy of Sciences of U.S.S.R.*, Section of Technical Sciences, no. 10, 1946, p. 1463-1472. (In Russian.)

Investigations of openhearth smelting resulted in development of certain criteria characterizing the transition of such a bath from the stratified condition to the turbulent state. The relation between these criteria and the coefficient of the heat transfer was determined, and the dependence of the coefficient on the amount of gas being bubbled and on the viscosity of the liquid was established.

2-38. Investigation of Viscosity and Fusibility of Blast Furnace Slags That Are Normal According to Pavlov. I. P.

Semik. *Bulletin of the Academy of Sciences of U.S.S.R.*, Section of Technical Sciences, no. 11, 1946, p. 1655-1671. (In Russian.)

Data obtained by experimental investigation of 16 slags recommended by M. A. Pavlov for smelting of different types of cast irons indicate that the surface films of basic slags are much more viscous than the fluid mass, a fact not taken into consideration by most investigators, thus resulting in some erroneous viscosity data.

2-39. Basic Openhearth Slags. Part II. K. L. Fetters and E. W. Mahaney. *Iron Age*, v. 159, March 13, 1947, p. 64-68.

The mineralogy of openhearth slags and use of the petrographic microscope as a basis for a better understanding of slag constitution. Concepts of slag-metal relations and slag control from the standpoint of reducing lime consumption and slag volume and increasing production rates.

2-40. Recent Developments in Steelmaking. J. A. Kilby and W. G. Cameron. *Metallurgia*, v. 35, Feb. 1947, p. 215-220.

Various processes employed and the economic as well as metallurgical aspects involved; the basic openhearth process as a method of steelmaking for high rates of production under widely varying conditions of burden and metallurgical load. (Condensed from paper for Institution of Engineers and Shipbuilders in Scotland.)

2-41. Some Questions on Interrelated Processes Going on in the Blast Furnace. B. M. Larsen. *Metals Technology*, v. 14, Feb. 1947, T. P. No. 2132, 13 p.

Some views held tentatively by the author, including a certain amount of evidence from operating records. Questions or problems which are believed suitable for investigation.

2-42. Soda Treatment of Blast Furnace Drosses at El Paso Smelter. A. A. Collins. *Metals Technology*, v. 14, Feb. 1947, T. P. No. 2139, 6 p.

New dross smelting process for lead metallurgy which has been applied with complete success for several years to drosses containing 12 to 40% copper. Three older methods had failed to give satisfactory results.

2-43. Slaggkontroll vid den Basiska Martinprocessen. (Slag Control in the Basic Openhearth Steel Process.) Torsten Collen. *Jernkontorets Annaler*, v. 130, no. 12, 1946, p. 649-652.

An introduction to four separate reports presented by a committee appointed in 1942 by the technical research board of Jernkontoret. As a result of the investigations the author believes that it is possible for the metallurgist in practical work to judge the composition of the slag with the aid of slag cake tests.

2-44. Undersökning av Löslighetsförhallandena i Fast Tillstand i de Binära Systemen av Oxiderna CaO, MnO, MgO och FeO. (Investigations of the Solubility in the Solid State in the Binary Systems of the Oxides CaO, MnO, MgO and FeO.) Holger Pettersson. *Jernkontorets Annaler*, v. 130, no. 12, 1946, p. 653-663.

Solubility of the above basic slag systems was studied by means of X-rays. The carbonates or oxalates were mixed in a mortar and rammed into small cylinders. The samples were held at 900 to 1600° C. and cooled slowly. Examination indicates that complete solubility probably exists in the systems CaO-MnO, MnO-MgO, MgO-FeO, and FeO-MnO. A certain mutual solubility was established in the system CaO-FeO. 19 ref.

2-45. Undersökning av Basiska Martinslagger i Metallmikroskop. (Microscopical Investigations of Basic Openhearth Slags in Reflected Light.) Holger Pettersson and Sven Eketorp. *Jernkontorets Annaler*, v. 130, no. 12, 1946, p. 664-677.

In order to follow changes in slag constitution during melting, polished specimens were examined using a metallurgical microscope. By means of a ternary phase diagram based on that of the system CaO-MgO-SiO_2, an attempt has been made to depict the course of solidification and explain the microstructure of the slags.

2-46. Bedömning av Basisk Martinslagg med Hjälp av Slaggkakor. (Estimation of the Composition of Basic Openhearth Slags by Means of Slag Cakes.) Holger Pettersson. *Jernkontorets Annaler*, v. 130, no. 12, 1946, p. 678-702.

Possibility of estimating the composition of basic openhearth slags from the appearance of slag cakes. Slag samples were collected from different iron works, analyzed, and the appearance of the cakes studied. Influence of certain factors on the appearance of the top and bottom surface and the fracture of a slag cake; connection between appearance and chemical composition. Error of the basicity estimation was seldom found to exceed 10%. The FeO content is more difficult to estimate.

2-47. Percentage Losses of Alloying Constituents in the High-Frequency Furnace as Compared to the Arc Furnace. C. Ciamberlini. *Engineers' Digest (American Edition)*, v. 4, Feb. 1947, p. 91-92.

Expensive losses occur when preparing Cr-W-Mo-V toolsteels. These losses can be completely eliminated by use of a high-frequency furnace and putting these alloying constituents into the cold charge. (Condensed from *L'Ingegnere, Italy*, Aug. 1946, p. 616.)

2-48. Thermal Requirements for Blast Furnace Operation. Charles E. Agnew. *Steel*, v 120, March 17, 1947, p. 120-122, 124, 126, 128.

Weight of moisture per ton of iron said to be most accurate indicator of effect of blast moisture on fuel economy. Heat generation, consumption, and losses in the three iron producing districts are analyzed. (To be continued.)

2-49. Ferrous Production Metallurgy in 1946. T. B. Winkler and J. S. Marsh. *Mining and Metallurgy*, v. 28, March 1947, p. 150-151.

Sponge iron, blast furnace, openhearth, and electric-furnace developments, including use of oxygen.

For additional annotations indexed in other sections, see:

3-55; **4**-20-26; **10**-41-42; **16**-29-30-31-34; **17**-17; **25**-35-38; **26**-42; **27**-58-63.

3 PROPERTIES OF METALS AND ALLOYS

3-55. Is the Hardenability of Boron Steels Indirectly Due to Complete Deoxidation? Gerard H. Boss. *Metal Progress*, v. 51, Feb. 1947, p. 265.

Several assumptions to help explain the unusual effect of boron on the hardenability of steel.

3-56. Creep in Hot Valve Springs. Alberto Oreffice and Luigi Locati. *Metal Progress*, v. 51, Feb. 1947, p. 269-270.

Creep behavior of small helical steel springs under special applications exists at 175° F. Its effect is revealed in the loss of load in needle valve springs in the fuel injector of diesel engines. Average test readings of four types of spring wire, after coiling and pretreating in various ways.

3-57. Metallurgical Substitutions. Albert M. Portevin. *Metal Progress*, v. 51, Feb. 1947, p. 271-272.

President of French Society for Metallurgy outlines the fundamental factors to be considered in making decisions concerning the use of alternate metals under the less stringent peacetime conditions now approaching. Many important relationships between properties of metals become readily apparent when they are compared at temperatures which are the same fraction of the difference between absolute zero and temperature of fusion, or Curie point, instead of at room or other fixed temperatures.

3-58. Hot Shortness of Some Aluminum-Iron-Silicon Alloys of High Purity. A. R. E. Singer and P. H. Jennings. *Journal of the Institute of Metals*, v. 73, Jan. 1947, p 273-284.

Research carried out on the hot cracking tendencies of castings and welds in the aluminum-iron-silicon alloys shows that as the percentage of silicon increases, the amount of cracking increases sharply to a maximum and then decreases to a low value. The effect of iron is to delay the onset of cracking, to reduce the severity of cracking at the maximum, and to push the position of the maximum to a higher percentage of silicon. Recommends that when commercially pure aluminum is to be cast or welded in conditions where contraction stresses may arise; the silicon content should not exceed the iron content.

3-59. Outstanding Properties of the Magnesium-Zirconium Alloys. C. J. P. Ball. *Metallurgia*, v. 35, Jan. 1947, p. 125-129.

The importance of zirconium as an alloying element in producing exceptionally high proof stress, ultimate stress and elongation. These wrought alloys are easy to work and have good mechanical properties which may bring about a revolution in the ultra-light alloy casting field. (To be continued.)

3-60. Low-Carbon Manganese-Vanadium Steel Forgings. *Vancoram Review*, v. 5, no. 2, p. 11, 16.

Typical tensile properties of manganese-vanadium steel of given composition in as-forged condition; minimum mechanical properties of the same steel and of the same size heated locally in a forge fire to about 1775° F.; and tensile test results illustrating the comparative insensitivity to various thermal treatments, even for steels at the top of the composition limits.

3-61. Vanadium Data Sheet—Vanadium Spring Steels. T. W. Merrill. *Vancoram Review*, v. 5, no. 2, p. 12-13, 18.

Tensile properties shown indicate, in a comparative sense, the high ratio of yield point to tensile strength, together with good ductility, which these steels possess.

3-62. Elastic Limits and Permanent Set in Springs. Part I. *Mainspring*, v. 11, Feb. 1947, p. 1-4.

Elastic limit and set in springs hardened and drawn from high-carbon steels or from such materials pretempered. (To be continued.)

3-63. Rigidized Metal—a Modern Material. D. E. Olshevsky. *Materials & Methods*, v. 25, Feb. 1947, p. 93-98.

Rigidized metal is design-strengthened sheet with two-dimensional pattern. Types of patterns and their properties; composite panels and structures; selected applications; advantages and limitations; assembly; future field of usefulness.

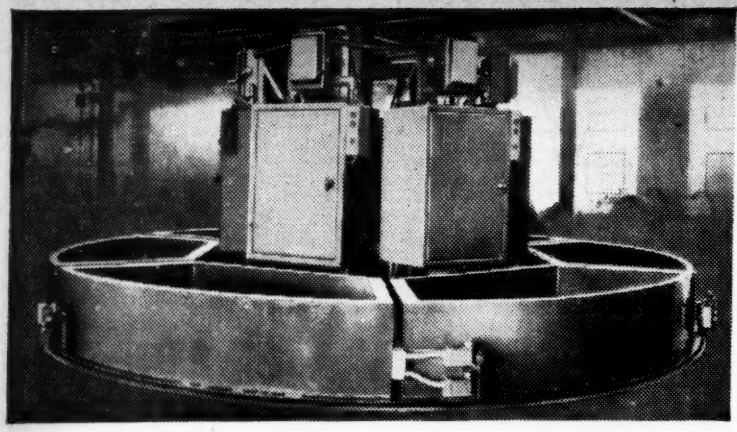
3-64. Stability of Alloys to Oxidizing Atmospheres. *Materials & Methods*, v. 25, Feb. 1947, p. 125.

Temperatures given in table are those below which scaling losses are less than 0.0002 to 0.0004 gm. per sq. cm. per hr.

3-65. New Magnetic Alloy Opens Way for Lightweight Motors. *Iron Age*, v. 159, Feb. 27, 1947, p. 59.

New alloy, 35% Co, 64% Fe, and 1% Cr, carries more magnetism than any other alloy practical for use in motors and generators and is tough enough to withstand intense vibration. It will make possible compact electric motors and generators that are an estimated 10% smaller and lighter than those of equal power now built for aircraft.

(Turn to page 16)



Machine for Centrifugal Casting of Welding Rods

and is kept spinning during pouring by means of an eddy-current brake.

Operation of this machine is entirely automatic, so that the foreman can set the rate at which the machine rotates and the time interval for the stops.

Hydro-Centrifugal casting machines, controlled and operated entirely by hydraulic power, have been introduced by Herman Pneumatic Machine Co. (R-402). Hydraulic power guarantees a smooth, stepless variation of table rotation speeds. Speeds can be instantly changed while the machine is operating by setting a dial control valve on the operating pulpit.

The power unit is separate from the casting machine and can be placed at any convenient location from which pipes can be run to carry oil to the centrifugal casting machine.

Only one operating valve and handle is required to start, brake, stop or reverse the machine. Reversal provides practically instantaneous stopping of the rotating table if the necessity arises. Inasmuch as the fluid motor is at the base and connected directly to the spindle of the machine, there is no possibility of slippage or any other damage to the unit when putting it into reverse for a quick stop.

Since the moving parts of the machine and many parts of the power unit are constantly immersed in oil, lubrication is practically unnecessary. All wearing parts are completely enclosed for protection from sand, dust, and other foreign matter.

Any number of machines can be operated from one power unit. Models available have table diameters ranging from 18 to 36 in. and accommodate molds weighing from 300 to 1500 lb., with maximum metal and mold load varying from 600 to 3000 lb.

New Allis-Chalmers centrifugal casting machines (R-403) feature an adjustable mandrel which can be quickly set to any angle from horizontal to vertical; thus the machines can be changed quickly from one job to another with a minimum of setup time. They are equipped with heavy-duty antifriction bearings and operate with a minimum of vibration at all speeds. The head depressions are designed to accommodate a variety of mold sizes, and molds can be easily and quickly changed. All parts are effectively cooled and lubricated regardless of the angle of the mandrel.

Precision Casting

Machines for precision casting that combine melting and casting have the advantage of reduced time between end of melt and transfer of the metal into the mold. For steel and other high-temperature alloys induction melting is accepted practice. A motor-driven machine newly introduced by Ecco High Frequency Co. (R-404) has the melting crucible mounted on the casting arm. When the melt is completed, the high-frequency coil is dropped clear of the crucible and the casting machine is put into operation, the metal being transferred directly into the mold, which is carried on the end of the casting arm.

A new injection machine for pattern making is being marketed by Kerr Mfg. Co. (R-405). It maintains the pattern material at controlled temperature, injects this material under pressure into the mold, and holds the mold closed during the injection cycle. Automatic opening and closing of the mold is an added feature. Pressure is high enough to hold shrinkage of the pattern material to a minimum. At such high pressures the material can be used at relatively low temperature in a soft rather than fluid state.

A gas-fired oven for burning out refractory molds is available from Alexander Saunders & Co. and is known as the Saunders No. 3 oven (R-406). It has been improved by substituting two long projecting-port atmospheric pipe burners with Venturi mixers in place of a single disk-port burner. Also an extra half-inch of asbestos insulating material has been inserted between the Insul-Therm refractory lining and the Transite outer case.

Furnace chamber is 18x18x12 ft. high with door opening on one side 18 x12 ft. high. Either a Brown single-point indicating pyrometer controller with a solenoid valve or a "Pyro" indicating pyrometer is provided as standard equipment. Temperatures to 1800° F. may be reached easily and, while developed particularly for wax elimination in the precision investment casting industry, this furnace may be used for tool hardening and other open-flame annealing work.

Mechanized Equipment—Shakeouts

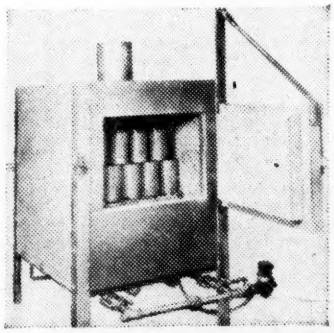
Royer Foundry & Machine Co. has made various improvements in its walking-beam shakeout (R-408). New units are wider than the original ones, the mechanism has a slightly greater "throw," and both the walking beam and the stationary grid surfaces now are hard faced to obviate wear from the sand, castings and flasks that track across them. The units also are built on I-beam supports to elevate them from the foundry floor so that a conveyer can be placed underneath to carry away sand.

Allis-Chalmers Mfg. Co. has added a new portable unit to its line of heavy-duty Foundromatic shakeouts (R-409). It is available in a variety of sizes and is especially suitable for the non-mechanized jobbing foundry. The company has also designed dual Foundromatic shakeouts consisting of two 8 x 10-ft. units for 50-ton capacity operations, and has in production the first four-unit shakeout consisting of four 6x8-ft. shakeouts, each with a capacity of 18 tons.

Core Making

Allis-Chalmers also reports a new foundry process under development which will bake sand cores by means of a dielectric heating unit complete with necessary conveyers and handling equipment for a specific job (R-410).

For making small cores a new machine offered by Newaygo Engineering Co. (R-411) promises savings up to 50% compared with hand-drawn methods. The unit, known as the Rappless core machine, allows drawing of any angle box by a quick adjustment of a hand wheel. Equipped with vibrators at each end, the machine is adapted to one or two-man operation. Cores move through the machine continuously, eliminating setting off of plates at the side. No special pins or grooved plates



Saunders Wax Eliminator Oven

are needed. Floor space required is 36x40 in.

A low-cost core-blowing machine for the production of cores weighing up to 3 lb. is announced by Wm. Demmler & Bros. (R-412). It will blow up to 200 cores per hr., and is especially adapted for quick adjustments and short-run jobs. The unit is equipped with both vertical and horizontal, automatically operated air clamps, a single hand valve clamping the corebox and blowing the core in one operation. The column of the machine serves as an air reservoir.

The sand magazine, 11 in. deep with a 3x5½-in. opening, is filled with sand by pushing it to register with the sand supply hopper. Maximum corebox depth the unit will accommodate is 10 in. Table height is adjustable between 30 and 36 in.

Redford Iron & Equipment Co. has an improved cartridge bench core blower (R-413) that requires a minimum of maintenance, the only wearing part being the rubber cartridge sealing disk, which can be replaced quickly. The arm casting in which the blowing cylinder is mounted has been made more sturdy, and bronze sleeve bearings have been inserted around the blowing cylinder. The column that supports the arm and blowing cylinder is utilized as an air reservoir. An air blow gun at the base of the column insures dry air for blowing cores. An air pressure gage is installed near the top of the column reservoir so that line pressure is visible at all times.

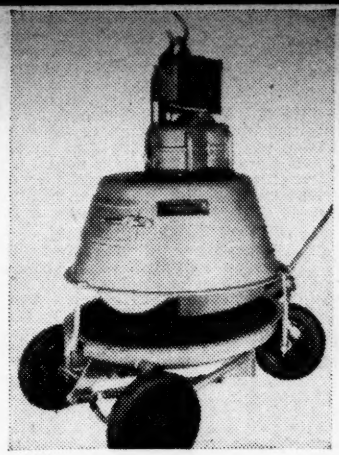
A core binder adapted for use in all metals is a mineral-type binder known as Kor-Rite, a product of Metro-Nite Co. (R-415). Advantages claimed for the material include adequate hot strength and collapsibility, short baking time, and reduction in cleaning costs and scrap castings. The binder is not affected by humidity and can be stored for long periods.

Sand Preparation

A portable sand mulling device manufactured by the Beardsley & Piper Co. and known as the Mulbaro (R-416) consists of a one-man barrow and a mulling mechanism constructed to fit over the barrow.

In operation the barrow is filled with

Moisture Meter for Sands



Portable Sand "Mulbaro"

sand and wheeled to the mulling location. The mulling unit, supported from a crane by a special lifting bale, is then lowered over the barrow and rubber-covered mulling wheels fit down into the sand. After the mulling cycle is completed, the mulling unit is raised and the barrow of mulled sand is wheeled to the molding site. Mulbaros are available to handle 3½ cu. ft. or 7 cu. ft. of sand per batch and mull either backing or core sand.

Reclamation of costly, specially treated molding sand is now being accomplished by means of a curing system with completely automatic control devised by Automatic Temperature Control Co., Inc. (R-418). Sequence and duration of all interrelated functions are electrically controlled.

Time periods are set on seven dials, used sand is automatically sprayed for fines removal and charged into a mulling hopper where a bonding agent is added prior to thorough mixing and subsequent discharge for cooling and re-use. Provision is made for operation of the process intermittently as well as on a continuous schedule.

A meter for determining the permeability of molding materials has been added to the Dietert line of sand control equipment (R-419). Known as the Permmeter, it can measure the air flow through specimens of any material. An automatically operated electric timer, driving a circular dial reading in cubic centimeters the air flow per minute at one gram pressure, is employed with a gasometer unit. The movement of the gasometer bell automatically starts and stops the timer when a given quantity of air or chosen gas is passed through the test specimen. The Permmeter performs all of the necessary timing and calculations.

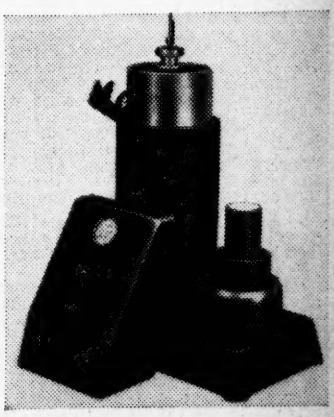
Dietert has also developed a molding sand density indicator (R-420) that shows the weight in lb. per cu. ft. of any molding material under a chosen degree of ramming compactness or under an A.F.A. standard sand specimen degree of ramming.

A moisture meter for foundry sands is a product of J. Thos. Rhamstine (R-421). Quick readings—as many as 15 per min.—may be obtained, and when set to a definite moisture percentage, these readings are accurate to within 0.25%. Two separate systems are incorporated in the instruments. One may be used direct on certain types of sands, without being attached to the a.c. lines. The second system provides amplification of the primary readings where the control or "corrector" may be used to set the meter needle to correspond to the scale figures. A suitable prod or pickup is supplied which need only be inserted into the sand to give a reading.

Molding Equipment

Johnston & Jennings Co. has designed a new portable jolt squeeze molding machine (R-422) featuring a one-piece cast steel squeeze frame operated entirely by air. A single valve controls all operations. Only two bearings are used in the squeeze frame. Squeeze cylinder diameter is 12 in., jolt cylinder diameter 5 in., table size 18x22 in., and air intake ½ in. Rubber guards on the squeeze head protect patterns, and the head is adjusted quickly for flasks of different height.

Facilitating fast, accurate mold handling, Champion speed-draw machines, manufactured by the Beardsley & Piper Co. (R-423) draw the mold from the pattern. Time consumed in turning molds over is thus eliminated and pattern mounting is greatly simplified. Accurate draw is assured by a crank mechanism load equalizer.



Dietert's Permeability Meter

These machines are available in two basic types—air operated, either stationary or portable, and the junior model, air or hand operated. Both types are manufactured in a wide range of sizes for handling flasks from 8 to 54 in. in width.

In mounting speed-draw machines, no pit is required and precise leveling is unnecessary. Quick, smooth draw and a long operating life are assured by adjustable one-piece gibs. Pattern height is rigidly maintained, contributing to casting uniformity.

(Turn to page 17)

3-66. Absorbed Gases in Cast Iron. E. V. Somers and D. W. Gunther. *Foundry*, v. 75, March 1947, p. 66-69, 218, 220, 222, 224, 226, 228.

Critical discussion of the literature on the effects of these gases and results of experimental investigations. The effect of tapping temperature on the physical and chemical properties of gray cast iron. 15 ref.

3-67. Cast Iron and Steel. Ernest C. Pigott. *Iron and Steel*, v. 20, Feb. 1947, p. 43-45.

Influence and commercial applications of constituent elements. Data on aluminum, arsenic, beryllium, boron, carbon, cerium, chromium. (To be continued.)

3-68. Cast Irons. Thermal Stability of Some Chromium-Nickel-Copper Alloys. Parts II and III. William F. Chubb. *Iron and Steel*, v. 20, Feb. 1947, p. 59-61.

An alloy containing 0.5% Cr, 0.5% Ni, and 1.5% Cr was relatively unstable to heat treatment. 0.4 to 0.6% Si was added to the alloy and the percentage of Cr was increased to 1.25 to 1.50. This alloy was much more stable. The effect of heat treatment when copper is present in excess of its normal solubility limit was investigated. Tables, charts, and micrographs.

3-69. The Heat of Combustion of Tungsten Carbide, WC. L. D. McGraw, Harry Seltz and Paul E. Snyder. *Journal of the American Chemical Society*, v. 69, Feb. 1947, p. 329-331.

Determined in a precision calorimeter, and heat of formulation calculated from the results. 11 ref.

3-70. Maximum Energy Product of Permanent Magnet Steels. Lionel Fleischmann. *Electrical Engineering*, v. 66, March 1947, p. 318.

A graphical method for finding the maximum energy product for any kind of material.

3-71. Quality and Service of Openhearth Steel Rails From the Kertch Works. L. L. Pinchusovitch and O. N. Uskova. *Bulletin of the Academy of Sciences of U.S.S.R.*, Section of Technical Sciences, no. 10, 1946, p. 1421-1429. (In Russian.)

Describes an experimental investigation of the properties of steel rails produced from an arsenic-containing ore in the openhearth. The wear properties of the rails were higher than those produced from other ores, and the arsenic content (0.09 to 0.15%) did not affect the strength of the steel.

3-72. A New Magnetic Material of High Permeability. O. L. Boothby and R. M. Bozorth. *Journal of Applied Physics*, v. 18, Feb. 1947, p. 173-176.

The preparation, heat treatment, and properties of Supermalloy, a magnetic alloy of iron, nickel, and molybdenum. In the form of 0.014-in. sheet it has an initial permeability of 50,000 to 150,000$_\mu$, a maximum permeability of 600,000 to 1,200,000, coercive force of 0.002 to 0.005 oersted, and a hysteresis loss of less than 5 ergs per cu. cm. per cycle at B = 5000.

3-73. The Effect of Hydrostatic Pressure on the Fracture of Brittle Substances. P. W. Bridgman. *Journal of Applied Physics*, v. 18, Feb. 1947, p. 246-258.

Effects of pressures above 25,000 kg. per sq. cm. on the fracture of glass, Carboloy, beryllium, phosphor bronze, Al_2O_3 (synthetic sapphire), pipestone (catlinite), and NaCl, under tension and compression. How it fits in with present theoretical concepts.

3-74. Outstanding Properties of the Magnesium-Zirconium Alloys. (Continued.) C. J. P. Ball. *Metallurgia*, v. 35, Feb. 1947, p. 211-214.

Magnesium-zirconium alloys have been developed which are relatively easy to work in addition to having exceptionally high-proof stress combined with high ultimate stress and elongation.

3-75. Residual Currents and Related Phenomena of Hysteresis in Disks of Superconductive Metals. N. E. Alexeivsky. *Journal of Experimental & Theoretical Physics*, v. 16, no. 10, 1946, p. 870-877. (In Russian.)

Hysteresis of superconductive metals and formation of the intermediate state of conductivity is believed to be caused by the transition of the metal from the normal to the superconductive state in a magnetic field. This transition is shown to proceed by formation of nuclei, which develop into a striated structure, resulting in formation of a residual field.

3-76. Dependence of Magnetostriction of Nickel on Initial Crystal Structure and on Sequence of Application of Magnetic Field and Unilateral Elastic Stresses. Ia. S. Shur and A. S. Chochlov. *Journal of Experimental and Theoretical Physics*, v 16, no. 11, 1946, p. 1011-1020. (In Russian.)

Changes in magnetostriction are influenced by the elastic oscillations induced by periodic application of cyclic stress in the presence of a magnetic field. The magnetostriction depends also on the initial crystal structure.

3-77. Zeitabhangige Erscheinungen in Eisen Enthaltenden Stoffen unter dem Einfluss Mechanischer und Magnetischer Krafte. (Time Dependent Phenomena in Iron-Containing Substances Under the Influence of Mechanical and Magnetic Forces.) J. L. Snoek. *Schweizer Archiv*, v. 13, Jan. 1947, p. 9-14.

Phenomena of dispersion and relaxation in ferromagnetic materials from point of view of elastic and magnetic aftereffect.

3-78. Copper-Manganese-Aluminum Alloys—Properties of Wrought Alpha Solid Solution Alloys. R. S. Dean, J. R. Long and T. R. Graham. *Metals Technology*, v. 14, Feb. 1947, T. P. No. 2142, 16 p.

The properties of alloys in the solid solution area of the system for compositions up to 50% Mn. Data for cold worked material (60% reduction by cold rolling) and for material annealed at two temperatures—1300 and 1200° F.

3-79. Principles of Magnesium Metallurgy. Williamson Wade Moss. *Light Metal Age*, v. 5, Feb. 1947, p. 8-15.

Physical properties presented in many tables.

3-80. Bearing Strength of Some Sand-Cast Magnesium Alloys. R. L. Moore. *National Advisory Committee for Aeronautics, Technical Note No. 1136*, Feb. 1947, 9 p.

Tests undertaken to determine the bearing strength characteristics of some magnesium alloy sand castings and the relation between these and AM403, AM260, and AM265 alloys. Data on compressive yield strengths and ultimate strengths in compression and shear are also included.

3-81. The Aging of Steel. B. D. Enlund. *Engineers' Digest (American Edition)*, v. 4, Feb. 1947, p. 61-64.

Mechanical aging of mild steels; effect of aging on elongation, reduction of area, yield point, tensile strength and hardness; effect of aluminum additions. Aging properties depend not only on composition, but also on heat treatment and structural condition. Brittleness can be prevented by appropriate heat treatment. (Condensed from *Jernkontorets Annaler*, v. 130, Oct. 1946, p. 553-592.)

3-82. Magnetism. R. M. Bozorth. *Reviews of Modern Physics*, v. 19, Jan 1947, p. 29-86.

General description of magnetism; permeable materials; permanent magnets; magnetization curves; stress and magnetostriction; properties of single crystals; temperature and the Curie point; effect of magnetization on other properties; magnetization in alternating fields; diamagnetism; paramagnetism; theory of ferromagnetism; measurement of magnetic quantities. (Reprinted from Encyclopaedia Britannica.)

3-83. Creeping Property of Soft Aluminum-Magnesium-Zinc Alloys at Temperatures from 90 to 180° C. Bollenrath and Grober. *Headquarters Air Materiel Command, Translation No. F-TS-1058-RE*, Feb. 1947, 15 p.

Alloys with varying zinc and magnesium contents have been tested to determine their creep at temperatures from 90 to 180° C. At the same time, other physical properties were checked and it was found that copper improved the creep performance. Alloys rich in magnesium have poor creep.

3-84. The Mechanism of the Embrittlement of Deoxidized Copper by Bismuth. E. Voce and A. P. C. Hallowes. *Journal of the Institute of Metals*, v. 73, Feb. 1947, p. 323-376.

Mechanical properties of coppers containing up to 0.01% bismuth have been determined by means of notched-bar tests at temperatures up to 850° C., and by notched-bar and reverse-bend tests after quenching from similar temperatures; the coppers tested by reverse bending contained up to 0.03% bismuth. Gives results of study and a short summary of the factors influencing the permissible bismuth content under practical conditions.

3-85. Ferromagnetism at Very High Frequencies. Part I. Magnetic Iron at 200 Megacycles. M. H. Johnson, G. T. Rado, and M. Maloof. *Physical Review*, v. 71, March 1, 1947, p. 322-323.

Variation of complex permeability of magnetic iron as a function of d.c. polarizing field at 200 megacycles in a half-wave coaxial resonator, part of whose central conductor was the metal under investigation.

3-86. The Magnetic Quenching of Superconductivity. M. J. Sienko and R. A. Ogg, Jr. *Physical Review*, v. 71, March 1, 1947, p. 319.

A mathematical relationship has been deduced from experimental data for the threshold curves of the "soft" superconductors Pb, Hg, Sn, In, Tl, CuS, Au_2Bi, Zn, and Cd. For these substances, the relationship departs from the parabolic shape for the "hard" elements and alloys.

3-87. Aluminum Alloys; Wrought R 300 Series. *Machine Design*, v. 19, March 1947, p. 159-162.

Chemical analyses; properties; physical constants; heat treating cycles; bend radii; tempers; characteristics; applications; fabrication; resistance to corrosion; galvanic corrosion; material designations.

For additional annotations indexed in other sections, see:

2-22-24-25-26; **4**-24-32-35; **5**-20; **7**-77; **9**-30-33-36-39; **18**-44-53; **19**-74-82; **20**-108; **22**-121; **23**-64-84-89; **24**-73-74; **25**-38; **27**-51.

SPECIAL BRONZES for all chemical and industrial purposes. Castings, rods, and forgings . . . 38 years' experience
American Manganese Bronze Co.
Holmesburg, Philadelphia 36, Pa.

4 STRUCTURE — Metallography & Constitution

4-19. X-Ray Analysis of Chromium-Molybdenum and Chromium-Tungsten Alloys. W. Trzebiatowsky, H. Ploszek and J. Lobzowski. *Analytical Chemistry*, v. 19, Feb. 1947, p. 93-95.

The structures of the above alloy systems were investigated by means of chemical and X-ray analyses. Lattice constants and melting points. Results compared with those obtained by other investigators. 12 ref.

(Turn to page 18)

A new alloy of bismuth, lead, tin and antimony with wide possibilities as a molding material for the casting of low-temperature melting alloys is known as Moldaloy (R-424). It is made by Trethaway Associates.

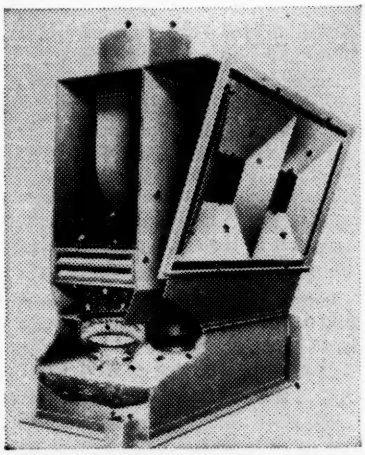
Moldaloy melts at 430° F., has a hardness of Brinell 22, compression of 8000 psi., tensile strength of 11,500 psi., and shrinkage approximately 0.001 in. per in.

A new type of aluminum pattern plate has a group of tough knurled steel inserts cast integrally into the plate so as to reduce wear by flasks and increase plate life. It is known as the Master cast and ground flat aluminum Tuff-Plate and is a product of the Kindt-Collins Co. (R-426). A description was published in *Metals Review* for September 1946.

A new and improved type of metal dowel for metal patterns and core boxes has also been announced by Kindt-Collins (R-427). These dowels are accurately machined from hardened steel, cadmium plated, and have a new type of shoulder and taper fit that keep the dowel anchored tight.

Dust Control and Ventilation

A self-contained unit, complete with intake hood, air cleansing process and exhaust fan, made by the Newcomb-Detroit Co., is known as the Uni-Wash shakeout booth (R-428). These booths are available in five standard sizes and may be used individually or in combination to collect dust from shakeout, core knockout, shaker screening, sand transfer, mold conveyer and pouring operations.



Uni-Wash Shakeout Booth

In operation, air is drawn into the booth and down the duct in the front to the Uni-Wash process. From there it goes through moisture separators, and is then distributed by the built-in discharge fan. The dirt from the air is collected in the form of wet sludge in the water tank in the bottom of the booth. An automatic sludge conveyer carries the sludge to the discharge point.

The automatic damper is another important advance that adapts the Uni-Wash shakeout booth to two conditions of operation. When the shakeout is started, the damper automatically directs the air from the booth to the out-of-doors; when the shakeout is shut off, the damper directs the clean, washed air back into the work area.

A cupola fly ash collector known as the Round Hydra (R-429) has been designed by C. C. Hermann & Associates to fit all sizes of cupolas for the removal of cinders, fly ash and dust, and to quench sparks and flames. The collector is a water-cooled cap which fits over and rests on top of the cupola stack.

Water is pumped upward and gushes out through the circular opening in the top plate at the apex of the cone. Curved vanes welded to the top plate distribute the water evenly. It flows in an even stream over the edge of the plate, forming an effective water curtain through which the hot gases from the cupola must pass. Thus the gases are cooled and the solids removed.

The equipment has no moving parts, no nozzles to plug, no auxiliary air to handle by fan and motor installations and no large and expensive air ducts to install.

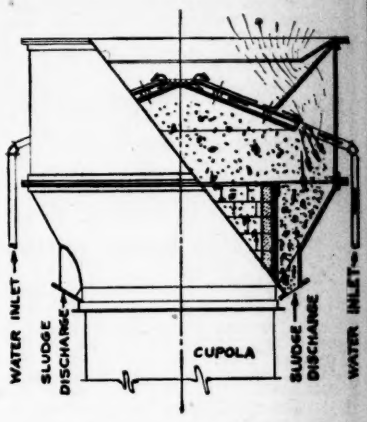
A portable dust collector that separates much of the dust at the point of intake before the heavily laden air reaches the filter tubes is made by Dust Filter Co. (R-431). A specially designed baffle plate placed beneath the filter tubes rotates the incoming air with great rapidity into the retaining pan at the bottom of the unit; heavy dust is deposited in this pan before it reaches the 36-in. filter tubes at the top of the unit.

Serving a similar purpose is a separate trap called the Velocitrap, (R-432), designed by Claude B. Schneible Co., for trapping heavy particles from air before it enters a dust collector. In foundries the equipment recovers abrasives from casting cleaning operations and foundry sand from downdraft shakeouts, screens, mullers and sand conditioning systems. Solids are separated by a slot-shaped opening in an elbow of the duct within the unit, the particles being expelled by centrifugal force and deposited in a hopper. The trap is adapted to any wet or dry-method dust collector.

Miscellaneous Equipment

A small metal-reclaiming mill with a 1-hp. motor (R-433) has recently been added to the three larger size mills made by Dreisbach Engineering Corp., one of which was described in the February issue of *Metals Review*. It is suitable for small nonferrous foundry refuse and sweepings.

The mill is a dustless, closed-circuit specific gravity concentrator. Two cast manganese steel crushing rolls are rigidly mounted on a frame inside the drum. The top roll has a flexible mounting to permit pieces of metal of various sizes to pass through without clogging. An exclusive feature is that all feeding and conveying is done above the water level, and the power is applied directly to the center crushing roll shaft. The waste material is pulverized, without abrading the metal, and is removed to the settling tank by automatic recirculation of the water.



Cupola Fly Ash Collector

Ajax Electric Co. calls attention to the successful use of its Ajax-Hultgren electric salt bath furnaces in connection with the sodium hydride process for descaling and desanding gray iron castings (R-435).

The internally heated Ajax electric salt bath furnace is particularly suited for this process. Its steel pot has an indefinitely long life because the heat is generated within the bath and does not have to be forced through the pot. The automatic stirring action produced by its patented principle of closely spaced electrodes prevents locally overheated zones, and permits close control of temperature. This is an important consideration, since sodium hydride decomposes excessively at temperatures only slightly on the high side.

Of special interest to foundrymen is an improved fuel-fired general-purpose batch-type furnace with quenching means and material handling equipment recently announced by the Electric Furnace Co. (R-436). It will operate over a broad range of temperatures or cycles and is capable of handling a wide range of casting sizes and shapes.

A typical installation consists of several heating chambers, a quench and a special gantry crane for handling the castings into and from the various heating chambers, loading stations, immersion quenching or air cooling stations. Each chamber may be operated independently of the others insofar as temperatures and cycles are concerned. Single-chamber furnaces are also available.

Addresses of Manufacturers on page 47

4-20. Some Mathematical Considerations and Experiments Concerning the Shape of Pipes in Ingots. E. W. Fell. *Journal of the Institute of Metals*, v. 73, Jan. 1947, p. 243-262.

Analysis of the shape of pipes formed in a mass of substance on freezing. The shapes of pipes in an upright and finite cylindrical block, when cooling proceeds from the vertical sides only and from the vertical sides and a flat bottom, were determined mathematically, and a comparison is made with natural pipes formed in aluminum alloys. The position of the solid-liquid interface in a finite cylindrical block of aluminum, cooling from the vertical sides and flat bottom, was determined mathematically. Periodic variations of the surface of pipes, and pipes and cavities formed by freezing of masses of spherical shape are considered.

4-21. A Theory of the Age Hardening of Aluminum - Copper Alloys, Based on Vacant Lattice Sites. F. Rohner. *Journal of the Institute of Metals*, v. 73, Jan. 1947, p. 285-321.

Results of an investigation of age hardening at room temperature of four different high-purity alloys of the duralumin type by measurements of tensile properties and electrical resistivity. An investigation of the aging of duralumin-type alloys at 100° C., directly after quenching, and after initial aging at room temperature. Results are in good agreement with the theory of vacant lattice sites.

4-22. Carbide Instability of Carbon-Molybdenum Steel Piping. R. W. Emerson. *Welding Journal*, v. 26, Feb. 1947, p. 104s-114s.

Results of an investigation of the complete failure of a carbon-molybdenum steel steam pipe adjacent to a weld revealed the failure to be the result of graphite segregation.

4-23. Interaction of the Valence and Inner Electrons in Ferromagnetic Transition Metals. C. V. Vonsovsky. *Journal of Experimental and Theoretical Physics*, v. 16, no. 11, 1946, p. 981-989. (In Russian.)

In the vicinity of the Curie point, where the magnetization changes markedly, there must be a substantial alteration in the effective mass and distribution of valence electrons.

4-24. A Thermodynamic Theory of the Fracture of Metals. Edward Saibel. *Metals Technology*, v. 14, Feb. 1947, T. P. No. 2131, 17 p.

General theory for the fracture of metals from the thermodynamic point of view. The theory developed leads to numerical results that compare favorably with experimental values obtained in the case where plastic flow precedes fracture as well as with earlier theoretical calculations for brittle strength. 29 ref.

4-25. Rontgenographische Untersuchung uber Gitterstorungen bei Verschiedenen Bruch-Ursachen und-Mechanismen an Aluminium-Legierungen. (X-ray Investigation of Lattice Disturbances in Aluminum Alloys Fractured under Different Conditions.) F. Rohner. *Schweizer Archiv*, v. 13, Jan. 1947, p. 14-21.

Through X-ray determination of lattice disturbances, information concerning the type of fracture and the causes of fracture may be obtained.

4-26. Influence of the Character and Duration of Crystallization on the Mobility of Molten Metal Between the Growing Crystals During Solidification. A. A. Botehvur and V. V. Kuzina. *Bulletin of the Academy of Sciences of U.S.S.R.*, Section of Technical Sciences, no. 10, 1946, p. 1459-1462. (In Russian.)

During investigation of the rate of crystallization of molten steel, it was noticed that the crust formed on the sides of the mold does not correspond to the marked dendritic character of steel. Further investigation shows that homogeneity of the castings depends to a large degree on the crystal structure of the liquid-metal interface between the solidified part around the outside of the mold and the molten interior portion and upon the amount of circulation of the molten part during the process.

4-27. The Influence of Crystal Face on the Electrochemical Properties of a Single Crystal of Copper. Henry Leidheiser, Jr. and Allan T. Gwathmey. *Electrochemical Society Preprint 91-6*, 1947, 11 p.

Importance of crystal face in several electrolytic processes in a copper sulphate-sulphuric acid solution investigated with the aid of electrolytically polished single crystals of copper. The processes studied were simple chemical etching, electroetching, electrodeposition, action of an alternating current, action of an alternating current superimposed on a direct current, and electrolytic replacement. It was found that all of these processes were influenced greatly by the crystal face exposed at the surface. The nature of the surrounding atmosphere was found to influence the physical form of the electrodeposit.

4-28. A Note of the Mode of Occurrence of Tellurium in Cast Iron. H. Morrogh. *Journal of the Iron and Steel Institute*, v. 155, Jan. 1947, p. 21-23.

By means of the polarizing microscope it is shown that in the presence of an excess of manganese over that required to neutralize the sulphur, tellurium forms manganese ditelluride. With no manganese or with insufficient manganese to balance the sulphur, iron monotelluride is formed. Various aggregates of manganese sulphide, manganese ditelluride, iron sulphide, and iron telluride are described.

4-29. Determination of Austenite Grain Size in Cast Steels. M. F. Hawkes. *Iron Age*, v. 159, March 13, 1947, p. 46-51.

Description and evaluation of a number of methods for rating grain size, including fracture, oxidation, normalizing, gradient quench, martensitic etch and the McQuaid-Ehn methods. General characteristics of grain size in cast steels.

4-30. The Relations Between Segregation Structure and Porosity in Chill-Cast and in Sand-Cast Ingots of 10% Tin Bronze. W. T. Pell-Walpole and V. Kondic. *Metallurgia*, v. 35, Feb. 1947, p. 181-187.

A chill-cast 10% tin bronze ingot, degassed and poured under optimum conditions for soundness into a water-cooled copper-faced mold, exhibited marked inverse segregation, increasing in severity from the base to the top of the ingot. Explanation for this type of segregation; segregation in a sound ingot of this type can be reduced by annealing at a temperature of 800° C. Comparison is made with a sand-cast ingot of similar composition and poured under the same conditions.

4-31. La Structure Cristalline Facteur des Réactions dans L'Etat Solide. (Crystal Structure as a Factor in Solid State Reactions.) J. Bénard. *Bulletin de la Société Chimique de France*, Sept-Oct. 1946, p. 511-521.

A critical survey of the literature on metallic solid-solution reactions, especially the experimental results reported. General deductions from the survey. The concept of geometric inertia and a rational classification of transformations taking place. Tables and diagrams. 35 ref.

4-32. The Microstructure of Wrought Nonarsenical Phosphorus-Deoxidized Copper Containing Small Quantities of Bismuth. T. H. Schofield and F. W. Cuckow. *Journal of the Institute of Metals*, v. 73, Feb. 1947, p. 377-384.

Brittleness of cold worked nonarsenical phosphorus-deoxidized copper containing small quantities of bismuth after quenching from 550° C. appears to be associated with films which are mainly present in the grain boundaries and are revealed by electrolytic polishing. Material quenched from 750° C. is not brittle and does not show such films. Brittle material showing films can be rendered ductile and free from films by quenching from 750° C. Precise nature of these films has not been established, but it is probable that they consist of bismuth or of a constituent containing bismuth.

4-33. Diffusion of Carbon Into Tungsten. M. Pirani and J. Sandor. *Journal of the Institute of Metals*, v. 73, Feb. 1947, p. 385-395.

Experiments were carried out with fused tungsten carburized at a series of temperatures. Extent of carbide formation was determined and values of the diffusion coefficient calculated. The activation energy of diffusion is 59,000 cal. per gram-atom. Examination of the microstructure of the carburized tungsten failed to provide evidence of grain-boundary diffusion. From X-rav powder photographs of the surface of the carburized tungsten it was concluded that the carburized zone is mainly WC, with a very small amount of residual beta tungsten. The mechanism of diffusion is discussed.

4-34. The Constitution of the Aluminum-Rich Aluminum-Iron-Nickel Alloys. G. V. Raynor and P. C. L. Pfeil. *Journal of the Institute of Metals*, v. 73, Feb. 1947, p. 397-419.

In view of differences between previously published diagrams for the aluminum-rich alloys of the system aluminum-iron-nickel, the system was re-examined by micrographical and X-ray methods, and additional data were obtained by the analysis of primary crystals extracted from slowly cooled alloys. Isothermal sections were determined at 600 and 550° C., and the general form of the previously published diagrams was confirmed. Differences exist, however, between the positions of the phase boundaries at equilibrium and after slow cooling. Results discussed in connection with the theory of the behavior of transitional metals in alloys.

4-35. Nature of the Steel Strengthening Process and of the High Hardness of Martensite. S. T. Kishkin. *Bulletin of the Academy of Sciences of U.S.S.R.*, Section of Technical Sciences, no. 12, 1946, p. 1799-1807. (In Russian.)

Highly dispersed iron carbides are formed during plastic deformation of steels. Strengthening of steels by cold working or heat treatment is caused by the blocking of slippage in the crystal structure by carbide formation. Coagulation of carbides reduces the strength of the steel. Martensite hardness is believed to be caused by the formation of microparticles of iron carbides during hardness testing on account of their deformation.

For additional annotations indexed in other sections, see:

3-73-75-76-78; 10-39-52-53; 11-24; 12-55; 14-75; 18-42-52; 19-68; 27-51-54.

5 POWDER METALLURGY

5-16. The Moment of Active Deformation. Harry L. Strauss, Jr. *Metal Progress*, v. 51, Feb. 1947, p. 254-255.

A method of hot pressing of powdered metals. Laboratory device for hot pressing in a carbon die. Comparative working pressures and working data, hot pressing versus conventional methods.

5-17. The Work of Huttig and Collaborators on the Mechanism of Sintering. W. D. Jones. *Metal Treatment*, v. 13, Winter 1946-1947, p. 265-278.

(Turn to page 20)

York Chapter Has First Televised Meeting

Reported by A. R. Kunkle
Project Engineer, York Corp.

A "first" in A.S.M. activities was chalked up by the York Chapter on March 12 with a televised meeting. Radio Corp. of America was host to the chapter at its plant in Lancaster, Pa., and made arrangements to conduct the business meeting by television.

Three television receivers were set up in full view of the audience in the lecture hall. The business meeting was then conducted by Chapter Chairman A. J. Kleiner and other officers, who were seated in the television studio in another part of the plant. Portable microphones were installed in the lecture hall so that members of the audience could be heard, not only by the immediate audience, but by the officers conducting the meeting from their remote headquarters.

Following the televised meeting W. H. Painter, product manager of R.C.A., spoke on "Some Commercial Aspects of Television".

Principal speaker of the evening was Arnold S. Rose, metallurgist at the R.C.A. plant; his subject was "Metallurgy in Electronics". Mr. Rose placed considerable importance on the fact that choice of any metal as an alloy for a specific vacuum tube application must involve the physical and chemical properties of the metal under high-temperature and high-vacuum conditions.

Metals selected for electronic tubes must fill certain specific requirements. For glass sealing metals these requirements are: (*a*) matching thermal expansion characteristics; (*b*) corrosion resistance; (*c*) capacity for leakproof seals to glass; (*d*) good electrical conductivity.

Metals used for glass sealing are Dumet; 28% chromium iron; 42-6 alloy (42% Ni, 6% Cr, balance iron); No. 52 metal; Kovar (54% Fe, 29% Ni, 17% Co); tungsten; molybdenum; and copper.

Cathodes and Filaments

Requirements for cathodes and filaments are: (*a*) low work function; (*b*) low vapor pressure; (*c*) high melting point; (*d*) good hot strength and stiffness; (*e*) good thermal and electrical conductivity; (*f*) good weldability, formability and coilability.

The metals used are tungsten, thoriated tungsten, and oxide-coated cathodes, indirectly heated. Coating for the latter is composed of barium, calcium, and strontium carbonates; nickel is the base metal

For anodes the requirements are: (*a*) good thermal and electrical conductivity; (*b*) good thermal radiation; (*c*) hot strength and stiffness; (*d*) ease of degassing on exhaust; (*e*) good "processability"; (*f*) no magnetism (for cathode ray tubes).

Metals used for anodes in small and medium power tubes are carbonized nickel, molybdenum, graphite, and tantalum. Metals used for anodes in large power tubes are molybdenum and oxygen-free high-conductivity copper. For cathode ray tubes anodes are made of 18-12 stainless steel or Nichrome V (80% Ni, 20% Cr).

Conducting a Meeting of the York Chapter in the Television Studio Apart From the Main Audience Are Shown (Left) A. S. Rose, Metallurgist for R. C. A., and (Right) A. R. Kunkle, Vice-Chairman of the Chapter

Grids

The requirements of grids are: (*a*) good hot strength and stiffness; (*b*) high work function; (*c*) good thermal and electrical conductivity; (*d*) good "processability"; (*e*) ease of reduction of oxides by hydrogen firing.

Metals used for grids in power tubes (side rods) are nickel, Magno (Grade D nickel), or 1% chromium copper. For power tubes with lateral wires, metals are molybdenum, platinum-clad molybdenum, Magno, or Hastelloy (20% Mo, 20% Fe, 60% Ni). Molybdenum and platinum-clad molybdenum are used for power tubes with welded grids. For grids in cathode ray tubes 18-12 stainless, Nichrome V, or nickel may be used.

Mr. Rose defined each operation in the manufacture of anodes, cathodes and grids for electronic tubes. This description was augmented by slides showing photomicrographs of the various metals in the finished condition. An interesting exhibit of various types and sizes of electronic tubes supplemented the lecture.

Boegehold Outlines H-Steel

Reported by Hans J. Heine
Metallurgist, Rockwell Mfg. Co.

The suggestion that steel should be ordered in accordance with the desired hardenability rather than by narrow chemical specification was but one of the many interesting points stressed by Alfred L. Boegehold, national president, in his address on "Correlation of Recent Data on Hardenability" before the Pittsburgh Chapter on National Officers' Night. He discussed the principles for the selection of steels on the basis of H-bands and the hardness required to insure desirable structures after tempering.

Mr. Ferral, director of metallurgy, Crucible Steel Co. of America, led the spirited discussion, while an interesting motion picture on winter sports served as "hors d'oeuvre".

Cast Iron With 200,000-Psi. Tensile Predicted

Reported by Frank Kristufek
U. S. Steel Corp. Research Laboratory

Prior to 1915, little was known about the structure of cast iron, and the use of this material was generally limited to applications where bulk and low shock resistance were of minor importance, according to Donald J. Reese, metallurgist of the International Nickel Co., in his talk on "Modern Engineering Cast Iron" at the February meeting of the New Jersey Chapter at Newark.

As a result of the development of metallurgical knowledge, we now have readily machinable cast irons possessing tensile strengths of 80,000 to 100,000 psi. and it is Mr. Reese's belief that the day is not far off when cast iron with a tensile strength of 200,000 psi. will be produced.

Although popularly considered brittle materials, white, mottled, and gray irons can be manufactured with definite elasticity and ductility as well as reproducible tensile strength and other properties. Ferritic-pearlitic gray irons exhibit up to 1.5% elongation; austenitic gray irons up to 3%.

Mr. Reese described cast iron as steel in which flakes of graphite are interspersed throughout the mass. The size, shape, and orientation of the graphite flakes affect the properties of the material.

Two relatively new practices employed to improve the inherent properties of cast iron were mentioned by the speaker. These are control of the carbon content of the iron, and ladle inoculation, which results in fine, well-distributed graphite flakes As a result of these metallurgical advances, new applications of cast iron are constantly being made. Most interesting of those mentioned by the speaker is for crankshafts of various types.

Following the talk by Mr. Reese, a lively discussion period was led by technical chairman John Bukowski.

Reviews 13 papers so far available from the Prague School covering an extended systematic investigation of the changes taking place when metal powders are heated at increasing temperatures, studying the changes involved by means of X-ray diffraction, adsorption, pycnometric, microscopical, potentiometric and other methods.

5-18. Trends in Powder Metallurgy. Part II. W. G. Cass. *Chemical Age*, v. 56, Feb. 1, 1947, p. 199-202.

Metallic hydrides, rare metal powders, metallic cohesion. Typical uses and principal methods of preparation for the different metal powders. (Conclusion.)

5-19. Plastic Deformation in Metal Powder Compact. Robert Kamm, Morris Steinburg and John Wulff. *Metals Technology*, v. 14, Feb. 1947, T. P. No. 2133, 15 p.

The fact that shrinkage in one direction and growth in another often occur during sintering led to an investigation of density gradients in cold-pressed metal powders. For this purpose, a deformable lead grid within iron powder was used. After pressing, the compact was radiographed, giving the deformed-grid pattern. From the radiograph, density and deformation, strain distribution and stress trajectories are readily measured.

5-20. Cemented Hard Carbide Compositions. Philip M. McKenna. *Tool Engineer*, v. 18, March 1947, p. 23-26.

The place of cemented carbide tools in man's progress. Applications and possible future applications in tools and other products. Physical and mechanical properties.

5-21. Sintered Metal Cavities. *Modern Plastics*, v. 24, March 1947, p. 144-145.

How plastic-molding cavities, difficult and costly to hob or machine, can be made by pressing metal powder over hob held in die, and baking.

For additional annotations indexed in other sections, see:
2-24; 3-69; 22-111; 27-52.

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6 CORROSION

6-41. Corrosion Resistance of Steel and Cast Iron. A. W. Spitz. *Chemical Engineering*, v. 54, Feb. 1946, p. 135.

Data for cast iron and "ordinary" steel in contact with about 60 common chemicals are given to supplement Nov. 1946 report, which largely skipped these common materials.

6-42. Wet and Dry Chlorine Vs. Materials of Chemical Plant Construction. *Chemical Engineering*, v. 54, Feb. 1946, p. 219-220, 222, 224, 226, 228, 230, 232, 234.

Part II of a three-part symposium in which representative materials are evaluated for services involving wet and dry chlorine and chlorine water. Materials covered are vitreous silica; Worthite; tantalum; silicones; rubber lining; glass-lined steel; carbon and graphite; Hastelloy; and wood.

6-43. A Note on the Selective Corrosion of Phosphor Bronze in Hot-Water Service. W. D. Clark. *Journal of the Institute of Metals*, v. 73, Jan. 1947, p. 263-271.

Phosphor bronze pump impellers handling hot feedwater and condensate on a power station suffered an attack analogous to dezincification. Micrographic, analytical, and X-ray evidence of the nature and products of the attack. Very great difference has been noted between the damage done to two surfaces of the same piece of metal, that at a machined surface being greater than that at as-cast surface. This has resulted from having exposed the pores in the metal to ingress of liquid, and attack throughout their depth. Had neither surface been machined or had the metal been free from appreciable porosity, the amount of attack would not have been very important. On the as-cast surface the attack progressed in a complex manner leaving a number of lamellar residues.

6-44. Marine Exposure Tests on Stainless Steel Sheet. Willard Mutchler. *National Advisory Committee for Aeronautics Technical Note No. 1095*, Feb. 1947, 26 p.

Corrosion tests of stainless steel sheets included in the marine exposure programs from 1938 to 1945.

6-45. Intergranular Corrosion Determination. H. Kirtchik. *Iron Age*, v. 159, March 6, 1947, p. 67-70.

Development of a cyclic test for measuring intergranular corrosion in aircraft materials caused by gasoline containing lead halides. In an effort to evaluate the factors responsible for failures of supercharger nozzle boxes, several types of stainless steels and Inconel were subjected to a laboratory duplication of actual corrosion conditions.

6-46. Designing to Prevent Corrosion. R. B. Mears and R. H. Brown. *Corrosion*, v. 3, March 1947, p. 97-118; discussion, p. 119-120.

Mechanisms of different types of corrosion and how to minimize it by proper selection of metals and of unions between dissimilar metals, by covering the joints in different ways, by cathodic means, and by use of inhibitors. 19 ref.

6-47. Results of Some Studies of the Condensate Well Corrosion Problem. Walter F. Rogers and Harry E. Waldrip. *Corrosion*, v. 3, March 1947, p. 121-138; discussion, p. 138-140.

The wetting power of condensates and waters for steel in the presence of each other, with and without wetting agents. Effect on the corrosion rate of the mixture studied by laboratory methods and extended to field operations.

6-48. Discussion of Paper on Chemical Corrosion Resistance of Lead. H. H. Uhlig. *Corrosion*, v. 3, March 1947, p. 149-150.

Lead or lead alloys should not be used in equipment coming in contact with food and beverages because of the toxicity of lead corrosion products. This point was not mentioned in "Chemical Corrosion Resistance of Lead" published in the December 1946 issue.

6-49. The Mechanism of Oxidation and Tarnishing. U. R. Evans. *Electrochemical Society Preprint 91-5*, 1947, 23 p.

The thickening of oxide films can occur in different ways. Rectilinear, logarithmic, and parabolic equations represent the different rate processes involved; types of deterioration (flaking, shear-cracking) associated with each form. The theory is applied to interpret the results of Vernon and others, and particularly to explain why conditions prevailing when a specimen is first exposed decide the corrosion rate, which often continues unchanged even if conditions change later on.

6-50. The Mechanism of Corrosion Fatigue of Mild Steel. U. R. Evans and M. Tchorabdji Simbad. *Proceedings of the Royal Society*, v. 188, Feb. 11, 1947, p. 372-391.

Investigation by chemical and electrochemical methods, in an attempt to find out how to prevent it by cathodic methods. The application of cathodic current was found to prevent corrosion under certain conditions, the current strength required increasing with stress range. Three or four different factors are responsible for the enhancement of rate of corrosion and of mechanical damage by alternating stresses. 31 ref.

6-51. Corrosion Resistance of Magnesium and AZ80X Magnesium Alloy Castings Containing Small Proportions of Silver and Lead. R. R. Rogers and W. Dingley. *Transactions of the Canadian Institute of Mining and Metallurgy*, v. 50, Feb. 1947, p. 49-56. (Bound with *Canadian Mining and Metallurgical Bulletin.*)

Accelerated chloride corrosion tests on AZ80X magnesium alloy castings with and without silver or lead additions. A similar series of alloys in which silver or lead was added to commercially pure magnesium was tested for comparison. The addition of 0.1% lead, or 0.05% lead +0.05% silver—particularly the former—increased the corrosion resistance to aqueous salt solutions considerably.

6-52. Review of Corrosion Literature for 1945. *Transactions of the Electrochemical Society*, v. 89, 1946, p. 41-74.

16 sections by specialists in respective subdivisions of the field. Most of the sections have references at the end, but a few consist of compilations of abstracts of the literature.

6-53. Nonferrous Pipe Minimizes Sludge Plant Corrosion. *Petroleum Refiner*, v. 26, March 1947, p. 138.

Applications of bronze and copper pipe and fittings for handling sludge in new plant of Union Oil Co.

6-54. Corrosion. Mars G. Fontana. *Industrial and Engineering Chemistry*, v. 39, March 1947, p. 91-A-92-A.

The prevention of corrosion caused by fluorine and by hydrofluoric acid.

For additional annotations indexed in other sections, see:
27-50.

7 CLEANING & FINISHING

7-67. The Color Anodizing of Aluminum. G. T. Colegate. *Metal Treatment*, v. 13, Winter 1946-1947, p. 248-264.

Various anodizing methods available, the dyes and other pigments used and practical control of the processes.

7-68. The Structure and Appearance of Metal Surfaces. J. H. Nelson. *Metal Treatment*, v. 13, Winter 1946-1947, p. 279-285.

Effect of surface defects of various magnitudes on the surface appearance of metallic objects. Particular attention to the process of "superfinishing".

7-69. The Protection of Steel by Tin and Tin-Alloy Coatings. *Metal Treatment*, v. 13, Winter 1946-1947, p. 286-289.

Comment on article by E. S. Hedges and W. E. Hoare, "Some New Aspects of the Protection of Steel by Tin and Tin-Alloy Coatings", with reply by the authors.

7-70. Airless Blasting Breaks Bottlenecks in Cleaning. Carl Zinnow. *Machine and Tool Blue Book*, v. 43, Feb. 1947, p. 151-152, 154, 156, 158, 160, 162, 164.

Fundamentals of airless blasting. Increased production and lowered manufacturing costs result from its utilization.

7-71. Measurement and Control of Interlaminar Resistance of Laminated Magnetic Cores. R. F. Franklin. *ASTM Bulletin*, Jan. 1947, p. 57-61.

Instrument was developed to test under simulated operating conditions insulating films applied to sheet steel

(Turn to page 22)

Control of Graphite Flake Size and Distribution Improves Cast Iron Strength

Reported by F. R. Anderson
Chief Metallurgist, Gardner-Denver Co.

Characterizing cast iron as a unique material, R. A. Clark, service metallurgist for Electro Metallurgical Co., speaking before the Denver Group of the Rocky Mountain Chapter, specified the highly desirable properties of wear resistance, machinability, damping capacity, low cost, excellent fluidity, low freezing temperature and low shrinkage in casting.

Graphite flake size and distribution are important factors controlling strength of cast iron, he said. Early attempts at improving strength were confined to strengthening the matrix. The fallacy of this approach is demonstrated by the fact that 130,000-psi. silico pearlite is in effect weakened to a value of 30,000 psi. by the presence of coarse graphite flakes. The modern concept places greater emphasis on control of graphite flake size and distribution.

For example, malleable iron, which has a 60,000-psi. matrix, displays strengths of 50,000 psi. because the nodular shape of the graphite is less detrimental to strength. With controlled graphite flake size, it is possible to produce 45,000-psi. gray cast iron without resorting to alloys. The detrimental effect of graphite lies in its interruption of the matrix structure; 1% by weight of graphite actually occupies a volume of 9%!

"Abnormal iron" Mr. Clark described as of lower strength and of being susceptible to scuffing on sliding surfaces. Abnormality may occur in any iron, depending on rate of cooling; it is characterised by an agglomeration of small but somewhat continuously arranged graphite flakes with which are associated small, easily dislodged grains of ferrite. Inoculants are used to reduce tendency to chill and abnormality.

Alloys are added to cast iron to increase strength and improve certain other properties. Silicon alone (2%) will strengthen ferrite 100%. Sulphur will increase chill and reduce strength. Phosphorus in excessive amounts causes porosity by draining away the low-freezing phosphide eutectic. Limiting phosphorus to 0.05% is the practice in some foundries to reduce internal porosity in unfed sections.

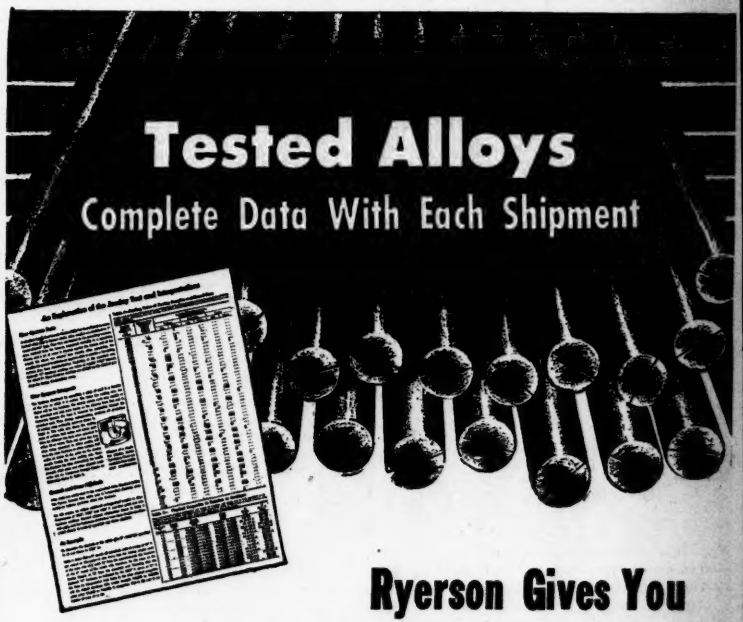
Silicon is the most important control element with the exception of carbon. Mr. Clark demonstrated the interrelationship of carbon and silicon as exemplified by the carbon equivalent (C.E.) values which are derived by adding 0.3 times the silicon and phosphorus percentage to the percentage of carbon. The lower the C.E. value for a given section, the higher will be its strength and hardness. An iron of 4.30 C.E. value, called eutectic iron, has low strength, but at the same time displays least shrinkage of any iron. Hypoeutectic irons of C.E. values below 4.30 have better strength and more shrinkage. Hypereutectic irons are unstable, carbon being given off as "kish", but low chilling tendency permits casting light sections such as piston rings.

Such alloy combinations as nickel and molybdenum will bring the tensile strength in the range of 90,000 to 100,000 psi. The carbide-stabilizing alloys, such as chromium, are particularly useful in applications requiring resistance to wear or abrasion.

R. J. Brandt of the Denver Office of the F.B.I. gave a coffee talk in which he outlined some of the many activities and services of that department. He stressed the need for intelligent functioning of all law-enforcing agencies in controlling the present high rate of juvenile delinquency and crime. This problem can be handled only by highly competent agencies.

To Direct Oak Ridge Lab

W. A. Johnson, manager of the metallurgical section of the Westinghouse Research Laboratories, has been selected to set up and direct a new metallurgical division of the Clinton laboratories at Oak Ridge, Tenn.



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in order to determine whether they are adequate and to make possible a practical method of quality control of their applications. Useful not only for quality control of the application of enamel and oxide films to sheet steel but also for studying the effectiveness of these films under various operating conditions and when applied in various manners.

7-72. Electrostatic Spraying of Steel Wall Panels. W. S. Reed. *Materials & Methods*, v. 25, Feb. 1947, p. 77-79.

Equipment and procedures in the application of finish coats by electrostatic spraying and infrared drying.

7-73. Ceramic Coatings for Steel in High Temperature Service. William N. Harrison, Dwight G. Moore, and Joseph C. Richmond. *Finish*, v. 4, Feb. 1947, p. 21-24, 56; *Ceramic Age*, v. 49, Jan. 1947, p. 13-16.

Development of new coating having outstanding properties for the exhaust systems of aircraft and other vehicles. (Condensed from paper to appear in *Journal of Research of the National Bureau of Standards*, v. 38, March 1947.)

7-74. Enamel Spraying Technique. A. J. Biddulph. *Foundry Trade Journal*, v. 81, Feb. 6, 1947, p. 133-135.

Equipment needed; spray guns; types of gun; containers; spray booth; exhaust and dust extraction; operating details; recent developments; and electrostatic spray. (Paper presented to the Institute of Vitreous Enamellers.)

7-75. Anodizing of Magnesium. D. Gardner Foulke. *Modern Metals*, v. 3, Feb. 1947, p. 22-24.

The advantages of surface treatment; the Manodyz process; physical and chemical properties of the film; prior treatment; subsequent corrosion resistance; dye coloring magnesium.

7-76. The Chemical Basis of Pickling. Heinz Bablik. *Sheet Metal Industries*, v. 24, Feb. 1947, p. 307-308.

Importance of diffusion and peptization. Effect of inhibitors. Influence of salts.

7-77. Developments in the Use of Tin as a Protective Metal. Ernest S. Hedges. *Sheet Metal Industries*, v. 24, Feb. 1947, p. 311-318.

Contributions of British research on tin and the effect on various tin-consuming industries. Studies on corrosion, the development of new tinning processes including "Protecta-tin", new alloys such as the tin-zinc alloys and speculum.

7-78. Flame Spraying by the Powder Pistol. W. D. Jones. *Sheet Metal Industries*, v. 24, Feb. 1947, p. 375-382.

Conditions governing the process and the various metallic and non-metallic protective coatings which are commonly applied in this way.

7-79. The Properties of Porcelain Enamel and Their Effect Upon Enamelware. Part I. H. D. Carter, B. W. King and H. C. Draker. *Finish*, v. 4, March 1947, p. 19-24, 56.

General procedure for investigation of kitchenware frits. Thermal shock and impact results on cover-coat and ground-coat expansion. Tables and graphs.

7-80. A New Canadian Enameling Plant for Sanitary Ware and Jobbing. A. T. Getz. *Finish*, v. 4, March 1947, p. 25-27, 58.

Plant designed to produce 50% sanitary ware and 50% general jobbing work. Imported partially fabricated bathtubs and sinks are completed and porcelain enameled.

7-81. Investigations of the Lapping Process. Part I. F. Eugene. *Industrial Diamond Review*, v. 7, Feb. 1947, p. 35-40.

Experimental equipment, procedure, and results. A special machine was built which permits factors such as speed of lap, pressure in test piece, and relative movement between lap and test piece, to be varied independently of each other. (To be continued.) (Translated from *Travaux et Memoirs du Laboratoire Central des Industries Mecaniques*, v. 2, 1945, p. 9-33.)

7-82. Good Galvanizing Practice Results in Long Pot Life. Wallace G. Imhoff. *Industrial Gas*, v. 25, Feb. 1947, p. 7-9, 22, 24.

Operations at San Francisco Galvanizing Works. Good results obtained from scientific furnace design, skilled engineering, good operating hot-dip galvanizing practice.

7-83. Electricity Coats Radio Tubes at R.C.A. Victor. Joseph G. Cowley. *Organic Finishing*, v. 8, Feb. 1947, p. 9, 11-13, 15-17.

Equipment and operation at the R.C.A. Victor plant involved in electrostatic spraying of radio tubes.

7-84. Surface Treatments for Magnesium Alloys. Part I. Rick Mansell. *Organic Finishing*, v. 8, Feb. 1947, p. 19-24.

Cleaning and pickling operations. (To be concluded.)

7-85. Conveyerizing Finishing Processes. (Conclusion.) John E. Hyler. *Organic Finishing*, v. 8, Feb. 1947, p. 33, 36-41.

Various types of conveyers and methods of mounting spray guns.

7-86. Cleaning Room Practice. Milton P. Schemel. *American Foundryman*, v. 11, Feb. 1947, p. 56-58.

An account of practice at Symington-Gould Co. where castings are sent through the finishing department in the following sequence of operations: flogging, burning, normalizing, sandblasting, chipping, welding, grinding, final chipping and, finally, placing on the selling rails.

7-87. Factors Affecting Orange Peel. John J. Steencken. *Journal of the American Ceramic Society*, v. 30, Feb. 1, 1947, p. 64-68.

Effects of spraying techniques on orange-peel surface of porcelain enamel. Volume of atomizing air per unit volume of atomized slip is the predominating factor. Conclusions and recommendations.

7-88. Metallizing of Spherical Surfaces. C. B. Christopher. *Welding Engineer*, v. 32, March 1947, p. 62-63.

Technique developed by the Soo Line to return battered booster balls for locomotives to service by coating with stainless steel.

7-89. Metal Diffusion. (Concluded.) *Iron and Steel*, v. 20, Feb. 1947, p. 47-48.

Chromizing at Krupps and German wartime practice.

7-90. Flame Spraying by Powder Pistol. W. D. Jones. *Foundry Trade Journal*, v. 81, Feb. 13, 1947, p. 157-158, 161.

Advantages of the Schori pistol in spraying zinc, aluminum, synthetic rubber, shellac and plastics.

7-91. Anticorrosive Pigments. *Paint Manufacture*, v. 17, Feb. 1947, p. 55-57.

Discussion of pigments used in paints for protection of steel surfaces, at a meeting of the London Section of the Oil and Colour Chemists' Association on Nov. 13, 1946.

7-92. Diamond Powder Increases Polishing Efficiency. *Iron Age*, v. 159, March 13, 1947, p. 51.

Elgin-processed powder is said to contain fewer fines, oversized flakes have been eliminated, and a closer range of particle sizes is apparent. Advantages claimed include more uniform cutting and polishing action and the elimination of gouging.

7-93. Water Wash Spray Booth Operation. Fred M. Burt. *Tool Engineer*, v. 18, March 1947, p. 29-31.

How pigment-laden air is exhausted from spray booths through water wash systems so that when the air emerges from the exhaust stacks it has all of the foreign particles scrubbed from it. Installation was used for continuous spraying of zinc-chromate primer and Navy gray synthetic enamel onto life rafts and other heavy equipment.

7-94. Superfinishing Methods and Applications. Part I. E. L. Hemingway. *Machinery*, v. 53, March 1947, p. 154-158, 174.

Details of the superfinishing process and methods of applying it to flat and cylindrical parts.

7-95. Cleaning and Plating Zinc-Base Die Castings. C. F. Nixon. *Machinery*, v. 53, March 1947, p. 180-182; *Monthly Review*, v. 34, March 1947, p. 298-309.

Polishing, buffing, cleaning, and copper-strike operation.

7-96. Metal Coating of Plastics by Vacuum Evaporation Techniques. F. C. Benner. *Electrical Manufacturing*, v. 39, March 1947, p. 107-109.

The metallizing of plastics parts in electrical products.

7-97. Plastic Coatings to Control Metal Corrosion—A Review. S. P. Wilson. *Corrosion*, v. 3, March 1947, p. 141-148.

Factors affecting corrosion and those to be considered in determining the type of coating. Advantages of various thermosetting and thermoplastic materials.

7-98. Selection and Application of Mechanical Finishes for Aluminum. Ralph E. Pettit. *Steel*, v. 120, March 17, 1947, p. 98-100, 115, 118.

Grinding, buffing, polishing, scratch brushing, ball burnishing, sandblasting and other mechanical finishing methods commonly used as surface preparation for subsequent chemical, electrochemical, or organic coatings and sometimes simply for decorative purposes.

7-99. Testing Maytag Washer Finishes. Charles W. Jensen. *Products Finishing*, v. 11, March 1947, p. 32-34, 36, 38.

How test panels are prepared and various tests to which they are subjected.

7-100. Barrel Finishing of Metal Products. Part VII. H. Leroy Beaver. *Products Finishing*, v. 11, March 1947, p. 80, 82, 84, 86, 88, 90, 92.

Research in the development of an abrasive-bond barrel-grinding procedure.

7-101. Mechanical Tumbling Cuts Cost for Parts Processing. Joseph V. Kielb. *Production Engineering & Management*, v. 19, March 1947, p. 75-80, 82.

Choice of abrasives and types of available equipment for utilizing the cost-saving advantages of tumbling for surface finishing and deburring small irregular shaped pieces.

7-102. Some Factors Influencing Tearing in Cover and Enamels. E. E. Howe and B. D. Bruce. *Better Enameling*, v. 18, March 1947, p. 6-7, 36-37.

In order to properly evaluate a change induced by any single factor, a test was devised that afforded a numerical figure for the amount of tearing produced under a given set of conditions. 4½ x 10-in. ground coated 20-gage steel sample plates were employed in all of the tests. Except where effect of weight of application was under observation, the cover enamels were applied in one coat at 45 g. per sq. ft. After spraying, the panels were dried in an electrically heated, automatically controlled, recirculating air oven.

7-103. Larger Furnaces to Speed American Stove's Enameling Program. *Ceramic Industry*, v. 48, March 1947, p. 74-75.

Conveyer system permits firing ground or cover coat in furnaces planned for individual firing. Lower drying temperature eliminates blistering of dry ground coat.

For additional annotations indexed in other sections, see:

11-25-30; **16**-35; **22**-118-124; **27**-66.

(Turn to page 24)

Jeffries Cites Metal Production Figures In Predicting Future of Metals

Reported by E. M. Sherwood

Metallurgist, Sperry Gyroscope Co.

On Feb. 3 some 20 past chairmen of the New York Chapter ASM were guests at dinner. Paul Merica, dean of past chairmen, recalled interesting details in the chapter's past history as a feature of Past Chairmen's Night.

The technical lecture was given by Zay Jeffries of the General Electric Co., Pittsfield, Mass., who presented "Some Thoughts on the Future of Metals". A prediction regarding the future of metals is difficult to make, Dr. Jeffries pointed out. In terms of past production figures the rate of increase in the amount of various metals produced is large.

Dr. Jeffries quoted total tonnage figures on ferrous and nonferrous metals. The figure for pig iron was chosen to represent the ferrous metals. In metric tons nonferrous production amounted to 38,100,000 while ferrous production amounted to 581,000,000 during the five-year period 1940 through 1944. A detailed summary of peak production of various metals was shown in the following tabulation:

METAL	PEAK PRODUCTION	YEAR
Pig iron	123,000,000 tons*	1942
Copper	2,700,000	1942
Aluminum	1,875,000	1943
Zinc	1,840,000	1941
Lead	1,722,000	1939
Tin	245,000	1941
Magnesium	222,000†	1943
Nickel	142,000	1943
Molybdenum	55,000	1943
Antimony	41,000	1943

*Manganese and chromium in ferroalloys, not listed separately.

†A considerable part of production used for incendiary bombs.

The present phase of metal production, with emphasis on quality, started in the 1920's and will probably continue indefinitely. In contrast, the last half of the nineteenth century was devoted to what may be called the "quantity" phase. Important to note will be new combinations of metals, both with each other (other than in the form of alloys) and in combination with nonmetallic materials.

One metal in particular has been responsible for three revolutions in our technical life, Dr. Jeffries said. This is tungsten, and its three revolutionary uses have been in high speed steel, electric lamp filaments and cemented carbides. The metals uranium and plutonium are, of course, of great interest at the present time, and undoubtedly will continue to be in the future. The quantity of these metals is insignificantly small but their political significance looms large.

Left to Right Are Paul Merica, Dean of New York Chapter Past Chairmen; Zay Jeffries, Past National President ASM and Principal Speaker at the Meeting; and Robert S. Archer, Also a Past National President

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Product Information

Cleaning, Finishing and Plating

• Editorial feature of the June Issue of Metals Review will be a "New Product Review" on the cleaning, finishing and plating of metals.

• All manufacturers with equipment, materials or processess for this field are invited to send in a description of their products IF they are new or improved in the past twelve months.

• Make certain your product is a part of this important article. Send 250 descriptive words and a product photograph, if available—not later than May 15.

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METALS REVIEW

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8 ELECTROPLATING

8-26. Bright Chromium Plating and Temperature Control. M. G. Herbach and C. W. Bowden, Jr. *Metal Progress*, v. 51, Feb. 1947, p. 257-259.

Types of chromium plate; preparation for plating; control of cleaning baths; chromium plating process; control of chromium plating; details of control system; installation.

8-27. Electroforming. E. A. Ollard. *Metal Industry*, v. 70, Jan. 31, 1947, p. 86-88.

Control of hardness and softness of copper and nickel deposits in electrodeposition through the control of essential constituents and exclusion of impurities in solutions. Finishing of electrodeposited piece.

8-28. Comparison of Electroplated Finishes Under Humidity Tests. E. E. Halls. *Metallurgia*, v. 35, Jan. 1947, p. 137-139.

Comments upon data presented by Frank Taylor in December issue. Author's reply.

8-29. Chromium Plating of Aluminum. C. J. Hinton. *Modern Metals*, v. 3, Feb. 1947, p. 14-15.

Preparation of the surface; zinc immersion process; surface cleaning and plating.

8-30. Electroforming. (Concluded.) E. A. Ollard. *Metal Industry*, v. 70, Feb. 14, 1947, p. 126-128.

Methods employed for producing ornamental plaques, a copper radiator shell, a graphophone record stamper, and a detonator tube by electrodeposition.

8-31. Surface Area of Chrome-Plated Nickel. Callaway Brown and Herbert H. Uhlig. *Journal of the American Chemical Society*, v. 69, Feb. 1947, p. 462-465.

Low-temperature adsorption of inert gas was the technique used to measure true "accessible" area of chromium-plated surface, as opposed to apparent area. Results show 10 to 50 times as much accessible area as apparent area.

8-32. Plating and Anodizing Aluminum. *Light Metals*, v. 10, Jan. 1947, p. 17-19.

Bath compositions for electrodeposition on aluminum and limitations of the anodic process as a method for finishing domestic ware.

8-33. Ammonia in Brass Plating Solution. S. Buchan and W. D. Rae. *IRI Transactions*, v. 22, Dec. 1946, p. 221-226.

A common method for bonding rubber to metal by means of an intermediate layer of electrodeposited brass. One of the most important factors controlling the type of deposit, which in turn influences the quality of the rubber-metal adhesion, is the ammonia content of the plating solution. The mechanism of the action of the ammonia was investigated by a unique method. Ammonia reduces the efficiency of deposition, but also increases throwing power of the solution and produces a more uniform deposit.

8-34. Problems in Plating Die Castings. Maurice R. Caldwell. *Die Castings*, v. 5, March 1947, p. 60, 62-63.

The problems of porosity, polishing and buffing; analysis of metal; design.

8-35. Testing of Plated Coatings on Zinc-Base Alloy Die Castings. E. A. Anderson. *Monthly Review*, v. 34, March 1947, p. 313-318.

A study of plated zinc alloy die-cast parts taken from 1941 model cars after about five years of service. They were produced in an era of shortages and substitutions and hence were expected to include variables not ordinarily encountered. Parts selected included every plated unit then made in zinc die castings except the grille. From each part one or more areas were selected for study. In each area the thickness of coating was determined by the microscopic method with direct measurement of the magnified image at 1000 ×.

8-36. Determination of Impurities in Electroplating Solutions. A.E.S. Research Project No. 2. Part V. Earl J. Serfass and W. S. Levine. *Monthly Review*, v. 34, March 1947, p. 320-327.

Procedure adopted for determination of manganese in nickel plating baths.

8-37. Bright Copper Plating. L. E. Browne. *Steel*, v. 120, March 17, 1947, p. 108, 128, 130.

Simple cyanide copper plating solution gives wide range of applications. Simple equipment and many advantages.

8-38. Electrotin Plate. Part I. The Influence of Plating Conditions on the Quality of Electrotin Plate Deposited From the Stannous Sulphate Bath. R. M. Angles, K. W. Caulfield and R. Kerr. *Journal of the Society of Chemical Industry, Transactions and Communications*, v. 65, Dec. 1946, p. 430-433.

The quality of tin plate formed under different plating conditions from the stannous sulphate-cresolsulphonic acid bath was compared by the thiocyanate and hot-water porosity test and by exposure in a humidity chamber. Within the ranges examined, the quality improves with increase of tin concentration of the electrolyte and with decrease of current density. Optimum concentration of acid depends on tin content. Raising the temperature impairs the quality of the deposits. No significant improvement was obtained by addition of commercial wetting agents.

8-39. Tin Plating and Control of Tin Solution by Anode Color. John Franklin Daymude. *Products Finishing*, v. 11, March 1947, p. 42-44, 46, 48, 50, 52, 54, 56.

Instructions for the operation of a low-caustic, low-temperature tin-plating solution. Plating solution under consideration is applicable to a wide variety of base metals and possesses excellent throwing power.

8-40. Common Industrial Electroplates. Part I. Ferrous Base Metals. P. W. Prouty. *Product Engineering*, v. 18, March 1947, p. 139-142.

Guidance for plating major ferrous construction materials for industrial and commercial applications. Preferential corrosion coatings including comparison of zinc and cadmium, seal coatings of such metals as nickel, chromium, copper, and tin.

For additional annotations indexed in other sections, see:
4-27; 7-77-95; 11-27; 23-85

9 PHYSICAL TESTING

9-29. The Theory of Wedge Indentation of Ductile Materials. R. Hill, E. H. Lee and S. J. Tupper. *Proceedings of the Royal Society*, v. 188, Jan. 30, 1947, p. 273-289.

The indentation hardness test has not yet been satisfactorily analyzed in detail on the basis of the mathematical theory of plasticity. The problem of indentation of a material by a lubricated wedge is a first step to a solution of the more complex three-dimensional problem of indentation by a cone or ball. The theory was found to satisfactorily predict the deformation of a grid of squares ruled on a cross section of a lead block.

9-30. Stress Rupture of Heat Resisting Alloys as a Rate Process. E. S. Machlin and A. S. Nowick. *Metals Technology*, v. 14, Feb. 1947, T. P. No. 2137, 13 p.

The theory of rate processes is first discussed, then certain equations derived from the theory are applied to predict stress and temperature dependence of the time of rupture. Agreement with experimental results was obtained for the three alloys investigated. Suggests use of the equations for interpolation and extrapolation, thus reducing the required number of tests, and recommends that the method be investigated more fully as a possible complete substitute for present empirical methods.

9-31. Is There a Relation Between Metallurgy, Engineering and Materials Specifications? Francis G. Tatnall. *Steel Processing*, v. 33, Feb. 1947, p. 92-95.

General discussion of the above question; measurement of service loads, structural static testing, the dynamic or life test, wind tunnel tests and high speed motion pictures, and the performance or service test.

9-32. American Steel Foundries Coil-Spring Test Machine. *Railway Mechanical Engineer*, v. 121, March 1947, p. 120-122.

A test machine for the large helical springs used in the trucks of railway rolling stock. Eight springs, radially disposed about a central crankshaft, are alternately compressed and released 12,000 times an hour, making fatigue testing practicable.

9-33. Malleable Iron Test Bars. J. E. Rehder. *Canadian Metals & Metallurgical Industries*, v. 10, Feb. 1947, p. 14-17.

Since it is difficult to have test bars that will give the exact properties to be expected from a casting, often metal used is much stronger or weaker than planned. They are also of little help in selecting an alternative material. Physical properties of malleable iron and the physical properties necessary in castings made of malleable. New applications of malleable iron. The necessity of testing castings under service.

9-34. The Initiation and Propagation of the Plastic Zone Along a Tension Specimen of Nylon. Julius Miklowitz. *Journal of Colloid Science*, v. 2, Feb. 1947, p. 193-215.

A study of the mechanical factors influencing the initiation and propagation of the plastic zone in nylon gives valuable data for studying localized yielding in mild steel.

9-35. The Stress-Strain Relationship of Nylon Under Biaxial Stress Conditions. Julius Miklowitz. *Journal of Colloid Science*, v. 2, Feb. 1947, p. 217-222.

A method by which the stress-strain characteristics of nylon under equibiaxial tensile stress were investigated. Results are used for comparison with the applied single-stress conditions, under which nylon showed a well-defined yield point and localized yielding. Results shed light on similar phenomena in mild steel.

9-36. Effect of Surface Finish on Fatigue Limit of Mild Steel. J. S. Caswell. *Product Engineering*, v. 18, March 1947, p. 152.

Investigations on the effect of surface scratches in the direction of and transverse to the principal stress direction. Fatigue tests were carried out on mild steel specimens, ground and polished in a circumferential direction, and also on other specimens which were ground and polished in a longitudinal direction. Probable stress distribution along a diameter for specimens ground and polished in the two ways.

9-37. The Initiation and Propagation of the Plastic Zone in a Tension Bar of Mild Steel Under Eccentric Loading. Julius Miklowitz. *Journal of Applied Mechanics*, v. 14, March 1947, p. A21-A30.

Results of several tests with flat tension bars of mild steel under eccentric

(Turn to page 26)

Six Topics Discussed at Round Tables Main Talk Is on Copper Brazing

Reported by William McCrabb
Dayton Rust Proof Co.

The January meeting marked the inauguration of a new activity for the Dayton Chapter. A round-table discussion was held after the regular dinner meeting and just preceding the technical meeting. Six different subjects were discussed at a series of six tables. Discussion at each table was led by a member of the chapter whose work and experience was along the line of the topic assigned for that table. Subjects and leaders were:

Gray Iron Castings—A. W. Schneble, Advance Foundry Co.
Corrosion Resisting Castings—Wm. T. Bryan, Duriron Co.
Plating—William McCrabb, Dayton Rust Proof Co.
Salt Bath Heat Treating—R. W. Edmonson, Metallurgical Service, Inc.
Toolsteel—S. M. De Poy, Dayton Forging and Heat Treating Co.
Welding—H. G. Weiler, Weiler Welding Co.

The technical meeting was presided over by George Oswald, chief metallurgist for the National Cash Register Co. and the chapter's first chairman. Speaker of the evening was H. M. Webber of the industrial heating division of General Electric Co. who addressed the chapter on furnace brazing of machined and stamped parts. His talk was concerned primarily with the copper brazing of steel parts and the atmospheres and furnaces required.

The discovery of copper brazing was made by accident in a laboratory. Some tungstic oxide was being reduced in hydrogen in a high-temperature furnace, when the furnace got out of control and went above the melting point of copper. When the work was removed, the copper had melted, flowed and fused—a phenomenon that led to the successful application of furnace brazing of electrical contact points. Since then many other applications have been made.

Suitable atmospheres, as well as correct type of furnace, are essential to avoid oxidation of the treated parts and the copper, and to permit proper wetting of parts with the melted copper and subsequent fusion. Light press fits of all low-carbon steel parts to be brazed are desirable whenever design will allow.

Mr. Webber pointed out that copper brazing allows industry to take advantage of two great production tools—automatic screw machines and punch presses—to make parts that can be brazed together, thus eliminating necessity for castings, forgings, elaborate machining operations, and excessive material loss in turnings and shavings.

An elaborate display of copper brazed assemblies emphasized the points Mr. Webber made. Pictures of industrial layouts and slides showing test data were also shown.

Explains Newest Bath for Sodium Hydride Descaling

Reported by Louis Malpoker
Metallurgist, Lincoln Engineering Co.

H. J. Babcock, research engineer, Ajax Electric Co., Inc., spoke to the St. Louis Chapter A.S.M. on "Commercial Applications of Electrode-Type Salt Baths". Mr. Babcock covered salt baths for solution heat treatment of ferrous and nonferrous alloys; brazing of copper, iron and aluminum; cyaniding, carburizing, martempering, and austempering of steel; heat treatment of cast irons, stainless steels, high speed steels, and high-carbon chromium die steels.

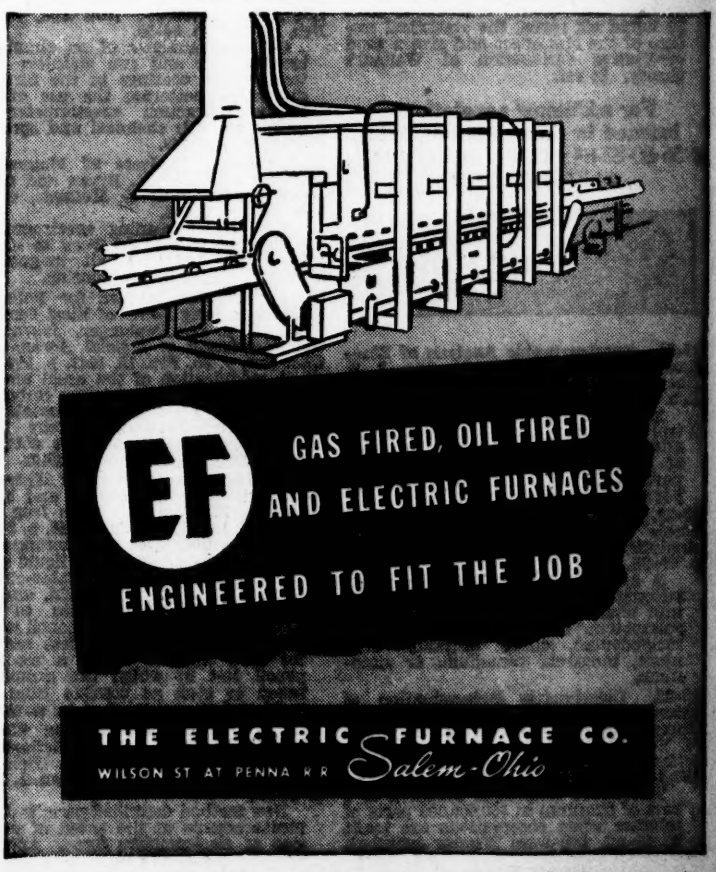
Mr. Babcock gave a clear explanation of the latest type of sodium hydride descaling bath.

Mr. Babcock explained the advantages of cycle annealing. There is a limit to size of parts which can be austempered and martempered and he warned of mixed structures caused by too slow a cooling rate to get around the nose of the T-curve.

Speaks on Salt Baths

Reported by C. Patrick Kenyon
Sheffield Steel Corp.

C. G. Atchinson (Left), Chairman of the Kansas City Chapter, and George D. Johnston (Right) of American Cyanamid Co. Mr. Johnston addressed the chapter on the use of salt baths in heat treating. Slides of graphs and photomicrographs illustrated just what can be done with this type of heat treatment



loading. Theory II is formulated describing how the first wedges, which initiate at the fillets on the load side of the bar, are able to propagate two-thirds of the way across the bar under a practically constant and reduced yield load. How further yielding of the initial wedges and the formation of additional wedges along the bar come about. In several tests the loading was applied centrically. Gage length of the specimen was varied to compare yielding under both types of loading.

9-38. The Initiation and Propagation of the Plastic Zone in a Tension Bar of Mild Steel as Influenced by the Speed of Stretching and Rigidity of Testing Machine. Julius Miklowitz. *Journal of Applied Mechanics*, v. 14, March 1947, p. A31-A42.

Results of several tension tests with round and flat bars of mild steel and iron, under the influence of variations in speed of stretching and testing machine rigidity. Emphasis in this work has been placed upon explaining the yield point phenomena, as viewed externally on a stress-strain diagram, by the observations made and data taken on the internal localized yielding. The study has been focused on the initiation of the plastic zone and the propagation of the boundaries of this zone, sometimes called the plastic working lengths, along the length of the tensile specimen.

9-39. The Influence of Size on the Brittle Strength of Steel. N. Davidenkov, E. Shevandin, and F. Wittmann. *Journal of Applied Mechanics*, v. 14, March 1947, p. A63-A67.

Studies of impact cold brittleness. Static bending of notched specimens and impact-tension tests display the size effect and therefore exclude possible influences of stress gradient and of high velocity. Experiments on static tension and bending of cylindrical specimens of brittle phosphorus steel in liquid air reveal the statistical nature of the size effect and give a good qualitative verification of Weibull's theory. 14 ref.

For additional annotations indexed in other sections, see:
3-56-80-83-84; 12-40; 18-53; 19-82; 24-73-78-82; 27-56.

10 ANALYSIS

10-31. Spectrographic Analysis of Zinc-Base Alloys. R. W. Smith and J. E. Hoagbin. *Analytical Chemistry*, v. 19, Feb. 1947, p. 86-92.

Method is applicable to routine control analysis of zinc-base die-casting alloys. Determinations can be made of tin, lead, cadmium and iron impurities, as well as of aluminum, copper and magnesium.

10-32. Determination of Nickel in Cobalt Steels and Alloys. Hyman Kirtchik. *Analytical Chemistry*, v. 19, Feb. 1947, p. 95-96.

A cyanide method has been found adequate for materials that may contain aluminum, beryllium, chromium, columbium, copper, iron, manganese, molybdenum, silicon, tantalum, titanium, tungsten, vanadium, or zirconium.

10-33. Colorimetric Determination of Titanium With Disodium—1, 2—Dihydroxybenzene—3, 5—Disulfonate. John H. Yoe and Alfred R. Armstrong. *Analytical Chemistry*, v. 19, Feb. 1947, p. 100-102.

The above reagent is sensitive to 1 part of titanium in 100,000,000 parts of solution when observations are made in 50-ml. tall-form Nessler cylinders. How to eliminate ferric ion interference. 11 ref.

10-34. Colorimetric Determination of Iron in Brass and Bronze. William Goodman. *Analytical Chemistry*, v. 19, Feb. 1947, p. 141-142.

Low results due to incomplete separation of iron have been reported. Method described eliminates this difficulty. Procedure is especially useful for silicon bronze.

10-35. The Chemical and Physico-Chemical Analysis of Iron and Steel; Five Years' Advancement. E. C. Pigott. *Metallurgia*, v. 35, Jan. 1947, p. 133-137.

An exhaustive and descriptive bibliography of contributions on ferrous analysis published during the period 1942-1946 inclusive. (To be continued.)

10-36. Modern Methods of Gas Analysis. Part I. W. D. Vint. *Metallurgia*, v. 35, Jan. 1947, p. 153-155.

The importance of accurate analyses, types of gases, and collection of samples.

10-37. Investigations on Colorimetric Methods of Metallurgical Analysis. Part II. G. V. L. N. Murty. *Metallurgia*, v. 35, Jan. 1947, p. 167-168.

A simple visual colorimetric procedure (standard series method) based on Vaughan's photoelectric method for the estimation of molybdenum in alloy steels. Results indicate that the new procedure, which is rapid and convenient for routine work, compares very favorably as to accuracy with the gravimetric and photoelectric methods.

10-38. Applications of Metallurgical Microchemistry to the Light Alloy Industry. Part II. Donald F. Phillips. *Metallurgia*, v. 35, Jan. 1947, p. 169-171.

Some of the problems handled by special microchemical laboratory. Equipment for handling this type of work. Adoption of various techniques in analytical field to micro scale.

10-39. Metallurgical Applications of the X-Ray Diffraction Spectrometer. Part III. John L. Abbott. *Iron Age*, v. 159, Feb. 27, 1947, p. 56-59.

Chemical analyses of an aluminum brazing flux and two stainless steel welding rod coatings in the form of diffraction patterns; the use of the X-ray diffraction spectrometer as compared with chemical and spectrographic analysis.

10-40. Quick Analyses of Magnesium Foundry Heats. F. R. Bryan and G. A. Nahstoll. *Materials & Methods*, v. 25, Feb. 1947, p. 90-92.

How direct reading spectrographic equipment is used by Ford to check, in a few minutes, all magnesium foundry heats before pouring.

10-41. Titration Method for Potential Soil Neutralizing Power of Blast Furnace Slags. C. J. Schollenberger. *Journal of the Association of Official Agricultural Chemists*, v. 30, Feb. 15, 1947, p. 117-124.

A modification of the usual method for determining the calcium carbonate equivalent of liming materials by acidimetric titration, whereby more accurate indications may be obtained in evaluating blast furnace slags.

10-42. The Determination of Hydrogen in Liquid Steel. J. E. Wells and K. C. Barraclough. *Journal of the Iron and Steel Institute*, v. 155, Jan. 1947, p. 27-32.

Five methods used for determination of the hydrogen content of liquid steel. They include use of a water-chilled mold, a cast-iron chill mold, and an ingot sample, in addition to the balloon-tube and notched-pencil methods. The best and simplest method for steel appears to be a modified pencil test in which the sample is taken as soon as possible from the mold and then quenched in water.

10-43. Nouvelle Méthode De Mesure Electrotitrimétrique. (New Method for Electrometric Titration.) P. Delahay. *Analytica Chimica Acta*, v. 1, Jan. 1, 1947, p. 19-32.

New method described permits direct measurements of the speed of evolution of electromotive force. Application of this technique permits more direct and accurate potentiometric, conductometric, and even amperometric titrations.

10-44. General Review of the Present Position of Quantitative Spectrographic Analysis. J. Gillis. *Analytica Chimica Acta*, v. 1, Jan. 1947, p. 38-49. (In English.)

76 references.

10-45. Nachweis von Scandium, Seltenen Erden, Zirkonium und Thorium mit Murexid. (Determination of Scandium, Rare Earths, Zirconium and Thorium Using Murexid.) G. Beck. *Analytica Chimica Acta*, v. 1, Jan. 1947, p. 69-71.

Reactions of scandium, the rare earths, zirconium, and thorium with murexid, a complex ammonium compound. A qualitative method for the detection of scandium with the same reagent. A titrimetric method for the determination of scandium with murexid and triacetic acid amine.

10-46. The Precipitation of Aluminum and Its Separation From Cobalt, Chromium, Nickel or Zinc by Means of Ammonium Benzoate. A. A. Smales. *Analyst*, v. 72, Jan. 1947, p. 14-16.

Optimum conditions were determined for precipitation of aluminum as benzoate. A single precipitation will give a practicable separation of 50 mg of aluminum from quantities of bivalent cobalt and hexivalent chromium up to at least 100 mg., but a double precipitation is desirable for similar amounts of bivalent nickel or zinc. The technique saves considerable time over usual methods, in which the other metals are removed from acid solution by electrolysis with a mercury cathode.

10-47. The Determination of Copper and Arsenic in Iron Pyrites by the Method of Internal Electrolysis. W. Cule Davies and Cyril Key. *Analyst*, v. 72, Jan. 1947, p. 17-21.

New method previously applied to copper in steel was modified for pyrites. It is simple, direct, rapid, and accurate. Details are given for determining arsenic in the presence of copper, and vice versa. The influence of other interfering elements.

10-48. 5-Hydroxyquinoline-8-Carboxylic Acid—A Colorimetric Reagent for Ruthenium. J. G. Breckenridge and S. A. G. Singer. *Canadian Journal of Research*, v. 25, Section B, Jan. 1947, p. 49-55.

Preparation and properties of 5-aminoquinoline-8-carboxylic acid and the 5-hydroxy compound, and use of the latter as a colorimetric reagent for ruthenium.

10-49. The Chemical and Physico Chemical Analysis of Iron and Steel. E. C. Pigott. *Metallurgia*, v. 35, Feb. 1947, p. 207-210.

Exhaustive descriptive bibliography of contributions on ferrous analysis published during the period 1942-1946 inclusive.

10-50. Volumetric Determination of Manganese by Titration With Permanganate in the Presence of Fluorides. V. M. Zvenigorodskaya and R. G. Gotsdiner. *Metallurgia*, v. 35, Feb. 1947, p. 223.

Disadvantages of the various volumetric procedures for determining manganese. (From *Zavod. Lab*, v. 12, 1946, p. 142, 152.)

10-51. Analysis of a Standard Sample of Natural Gas by Laboratories Cooperating With the American Society for Testing Materials. Martin Shepherd. *Journal of Research of the National Bureau of Standards*, v. 38, Jan. 1947, p. 19-51.

A standard sample was analyzed by 30 cooperating laboratories using volumetric absorption and combustion techniques, in order to aid in the standardization of methods. Data are presented in a series of frequency distribution plots. Heating value and

(Turn to page 28)

Quarter-Size Models Used in Designing Auto Body Dies

Reported by Glenn D. Boyer
LaSalle Steel Co.

Sheet metal stamping and deep drawing have advanced a long way from the stamping of coins done 400 years ago to the production of such items as the Lincoln front fender of today, said N. E. Rothenthaler, superintendent of production, steel operations, Ford Motor Co., in a talk before an overflow meeting of the Calumet Chapter on Feb. 11.

Leaving the metallurgical developments in the production of cold rolled sheet steel to the steelmen in his audience, Mr. Rothenthaler confined his talk to the controls used in the press shop for the production of deep drawn stampings and to the procedure for the development of new body designs and new dies for outer body parts.

In addition to the common physical tests on the sheet before stamping, each scrapped part at the Ford plant is studied in detail to determine the cause of failure. Metallurgical features such as bad surface or internal quality of the sheet may be the cause, or the part may fail because of improper manufacturing practices in the press shop. From these observations adjustments and corrections can be made quickly in the press operation.

Mr. Rothenthaler described the evolution of a new design and the development of the necessary dies. After the management has approved the styling department's design, quarter-size clay models are made and then a full-size model is finished in detail. Master die models and production dies are made from this model, with the cooperation of the production design department, tool design, templet department and pattern shop. Much of the development work is done on quarter-size models. These are exact to scale in every detail but cost only a tenth as much as the full-size model.

Scribe marks show the amount of elongation on the parts; the dies are spotted for uniformity with proper clearances, the pad pressure is regulated through trial and error methods, and finally the production dies are developed.

Electric Furnace Pres. Dies

Roland F. Benzinger, president of the Electric Furnace Co., Salem, Ohio, died at his home on March 25 after a 22 months' illness.

Mr. Benzinger, who was 55 years of age, was one of the founders of the Electric Furnace Co., having served as its vice-president and secretary from 1923 to 1937 and as its president since 1937. He was a member of the American Society for Metals and served as president of the Industrial Furnace Manufacturers Association for a number of years.

Los Alamos Receives National Charter

Formal Presentation of a Charter to the Recently Organized Los Alamos Chapter ● Was Made on March 18 by E. E. Thum, Editor of Metal Progress. Shown are (left to right) James M. Taub, chapter secretary; Frank Kubosch, chairman, accepting the charter; and Mr. Thum. In the main address of the evening Mr. Thum traced the history of the A.S.M. and concluded with a resume of some metallurgical advances during the war years

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specific gravity determined by analysis are compared with Bureau of Standards determinations. Need for standardization.

10-52. Apparatus and Techniques for Practical Chemical Identification by X-Ray Diffraction. Charles S. Smith and Richard L. Barrett. *Journal of Applied Physics*, v. 18, Feb. 1947, p. 177-191.

These methods are reviewed from the point of view of apparatus and techniques recently made commonly available, with particular emphasis on the use of long wave-length X-radiation. The discussion is designed especially for the person who wishes to make use of this important analysis tool but who is not an expert in X-ray diffraction. 16 ref.

10-53. Charts for Computation of d-Values in X-Ray Diffraction Chemical Analysis. Orley E. Brown. *Journal of Applied Physics*, v. 18, Feb. 1947, p. 191-198.

Charts for important iron, chromium, copper, molybdenum, and cobalt lines.

10-54. Carrier-Distillation Analysis of Uranium. *Chemical and Engineering News*, v. 25, March 17, 1947, p. 777.

A new spectrographic method which permits detection of 33 impurity elements, some in concentrations as low as a few tenths part per million, developed at the Bureau of Standards in 1942 for use by the Manhattan project.

For additional annotations indexed in other sections, see:
8-36.

11 INSTRUMENTS Laboratory Apparatus

11-21. Notes on Polishing Technique. *Metal Progress*, v. 51, Feb. 1947, p. 260-264.

Polishing of 0.60 Carbon Steels, by C. Patrick Kenyon; Attack Method for Preparing Tungsten, by Harry W. Woods; Improved Polishing Circuit, by Julius Horowitz and Joseph Maltz.

11-22. Electrical Detection of Traces of Poisonous Gases in the Atmosphere. J. Boeke. *Philips Technical Review*, v. 8, Nov. 1946, p. 341-345.

A catalyst of finely divided platinum which catalyzes an oxidation reaction is found to be hindered in its function by many gases which are also poisonous to the human body. Based on this fact, an instrument has been designed which can detect the occurrence of poisonous gases, for instance carbon monoxide in mines, garages or boiler-houses, and hydrocyanic acid gas in galvanizing shops.

11-23. The Metallurgical Microscope. D. E. Roda. *Iron Age*, v. 159, Feb. 27, 1947, p. 53-55.

Excellent results can be expected with proper use of microscope even in the upper and lower limits of magnification. Photomicrographs show the same area of a steel specimen, ranging from 115× to 3900×.

11-24. A Method of Using Marked Phase Boundaries. Robert Jagitsch. *Nature*, v. 159, Feb. 1, 1947, p. 166.

Method uses a minute amount of a substance which does not react with either of the phases or interfere with their reaction to determine the direction of migration between solid phases. Method has been found suitable for several systems listed.

11-25. Evaluates Finishes. *Steel*, v. 120, March 17, 1947, p. 112.

Evaluation of surface finish or roughness is obtained by a new National Bureau of Standards method in which a carefully prepared plastic replica of the surface is analyzed by photoelectric means. Replica is produced by applying a suitable solvent to the test surface, and pressing on a strip of clear plastic film. When dry, the film is readily stripped from the surface.

11-26. Interferometric Determination of Apparent Thickness of Coatings. W. K. Donaldson and A. Khamsavi. *Nature*, v. 159, Feb. 15, 1947, p. 228-229.

Method for measuring thickness of evaporated metal films.

11-27. Surface Finish Requirements. J. T. Ford. *Die Castings*, v. 5, March 1947, p. 55-56.

Microscope, reflection meter, and profilometer for examining surfaces. The profilometer is the best of the three methods for defining roughness of raw and plated die-casting surfaces.

11-28. Het Electronenmicroscoop. (The Electron Microscope.) H. J. De Heer. *Metalen*, v. 1, Feb. 1947, p. 101-104.

The principles of the electron microscope and certain design problems. Describes the instrument at the Netherlands Institute for Electron Microscopy at Delft, Holland.

11-29. Some Applications of Optical Crystallography. N. H. Hartshorne. *Endeavour*, v. 6, Jan. 1947, p. 15-20.

Principles and applications of the polarizing microscope to identification and analysis of solid substances.

11-30. Practical Aspects of Surface Finish Measurement Instrumentation. James A. Broadston. *Iron Age*, v. 159, March 20, 1947, p. 51-55.

Practical application of surface finish control. Development of finish control and instruments available for measuring surface finish in the plant. Effectiveness, costs and methods of using various types of finish control devices.

For additional annotations indexed in other sections, see:
2-45; 3-69; 4-29; 7-68-71; 8-28; 10-36; 14-85.

12 INSPECTION AND STANDARDIZATION

12-35. Rail Failure Statistics. *American Railway Engineering Association Bulletin*, v. 48, Feb. 1947, p. 673-689.

Progress report presents rail failure data reported through Dec. 31, 1945.

12-36. Investigate Joint Bar Failures and Give Consideration to the Revision of Design and Specification. *American Railway Engineering Association Bulletin*, v. 48, Feb. 1947, p. 714-729.

Work conducted at University of Illinois during 1946.

12-37. Corrugated Rail—Causes and Remedy. *American Railway Engineering Association Bulletin*, v. 48, Feb. 1947, p. 729-733.

Includes second progress report on corrugated rails by R. E. Cramer. A typical "corrugated" rail was examined in the laboratory, and a technique was devised to study the effect of wheel slippage in producing hard spots on rails.

12-38. Development and Characteristics of Fractures Under Engine Burns in Rail, Together With Investigations as to the Effectiveness of Welding-Up Engine Burns by Oxy-Acetylene or Electric Methods. *American Railway Engineering Association Bulletin*, v. 48, Feb. 1947, p. 734-750.

Committee-progress report on rolling-load tests on burned rails, and a report on the preparation, testing, and results of examination of rails damaged by spinning locomotive driving rolls. This causes visible effects called "driver burns," which cause extreme hardness because of development of martensite structure.

12-39. Investigate Causes of Shelly Spots and Head Checks in Rail Surfaces for the Purpose of Developing Measures for Their Prevention. *American Railway Engineering Association Bulletin*, v. 48, Feb. 1947, p. 750-766.

Committee report includes a summary of service inspection data; results of a field investigation by A.R.E.A.'s research staff on applied vertical wheel loads and position of centroid of wheel bearings calculated from measured vertical web stresses on a 6° curve of N. & W. Railway, in an attempt to account for shelling in the outer rail of the westbound track; fifth progress report of studies at University of Illinois on results of laboratory rolling-load tests and preliminary report of Battelle Memorial Institute's study of shelled rails.

12-40. Investigate Recent Developments Affecting Rail Design. *American Railway Engineering Association Bulletin*, v. 48, Feb. 1947, p. 767-808.

Committee report includes results of analysis made by the research staff of the A.R.E.A. of the stress measurements made on the N. & W. in 1945; a summary of tests made by the research staff of the A.R.E.A. on 90-lb. A.S.C.E. and 112-lb. R.E. rail in 18° curves on the D., T. & I. Railroad; and progress report on a study of the fatigue strength of rail web steel, conducted at the University of Illinois.

12-41. Thirteenth Progress Report of the Cooperative Investigation of Failures of Railroad Rails in Service and Their Prevention. R. E. Cramer. *American Railway Engineering Association Bulletin*, v. 48, Feb. 1947, p. 809-818.

Examination of control cooled and Brunorized rails which failed in service.

12-42. Inspecting Metals With Supersonics. H. Nicholson and L. Rotherham. *Steel*, v. 120, Feb. 24, 1947, p. 72-75, 114, 116, 118, 120.

Results of applying this testing method in works practice to larger masses, billets, plates, castings and welds. Conditions necessary for practical testing.

12-43. Precision Measurement. Section II. Instrument Inspection (Cont.). Part VIII. Inspection of Height Gage and Solid Square. Warren Baker. *Machine and Tool Blue Book*, v. 43, Feb. 1947, p. 241-248, 250-252, 254.

The inspection of scaled-type and transfer-type height gages. Tests for flatness. The method used to determine perpendicularity of height gages.

12-44. Carbon and Alloy Steels for General Service Applications. *Metallurgia*, v. 35, Jan. 1947, p. 130-132.

Schedule B.S./S.T.A.5, revised and issued for the Ministry of Supply as a permanent document for common use at all stages from development to production. Attention is directed to additions of detail, to additional steels included, and to the amplification of notes on their selection.

12-45. How to Get Good Detail in X-Ray Negatives. *American Machinist*, v. 91, Feb. 27, 1947, p. 81-84.

Hidden defects in workpieces are revealed in proper detail if certain basic factors are understood and used in making radiographic examinations. Interpretation of radiograms.

12-46. Quality Control Aids Supervisors. Part II. David T. Armstrong. *American Machinist*, v. 91, Feb. 27, 1947, p. 96-100.

Quality control data plotted in graph form and provided with upper and lower control limits show effect of process control.

12-47. Standard List of Seamless Mechanical Tubing. *American Machinist*, v. 91, Feb. 27, 1947, p. 123.

Tabulated list of sizes for warehouse stocks of round seamless cold finished mechanical tubing made of carbon steel with 0.25% carbon.

12-48. The Classification and Recording of Spot Weld Defects Revealed by Radiography. R. C. McMaster, F. C. Lindvall and Edythe Dial. *Welding Journal*, v. 26, Feb. 1947, p. 121-128.

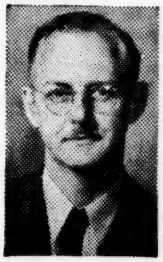
(Turn to page 30)

Lecture Course on Heat Treatment Tells Why and How

Reported by Ray E. Cross

Chief Metallurgist, Michigan Light Alloys

The winter lecture course on "The Principles and Practice of the Heat Treatment of Steel" sponsored by the West Michigan Chapter ⊕ came to a close March 12. This lecture series was organized and presented by L. J. Haga, president of State Heat Treat, Inc. The meetings were held in Grand Rapids every Wednesday evening from Jan. 15 through March 12. The course was open to anyone interested in the heat treatment of steel; attendance ran from 75 to 150 individuals at each lecture.



L. J. Haga

The lectures were designed to explain in simple language the why and how of the common heat treatments of steel. Open discussion was encouraged on specific or current heat treating problems and solutions were given and questions answered.

The highlight of the course to many was the plant inspection tour through State Heat Treat, Inc. Actual heat treating and quenching operations were observed to provide a clearer picture of the various operations and techniques being studied.

Painting Metal Presents Some Vexing Problems

Reported by R. B. Miclot

Lunex Co.

Seeing to it that a desired paint performs satisfactorily on a specific metal surface oftentimes presents a vexing problem, according to H. E. Spitzer, head of the Chicago technical service department of the Sherwin-Williams Co. Mr. Spitzer talked before the Tri-City Chapter ⊕ on "Painting Metal Surfaces".

Selective cleaning treatments are essential in preparing the metal for painting, he continued. Choice of the proper paint and correct application play an important role in producing quality coated metal products.

Such properties as resistance to abrasion, thermal shock, blistering, and corrosion from acids or alkalis must be considered. The effect of humidity and temperature on these properties warrants careful study. Optimum resistance properties for paints are determined from examination of environmental conditions of the coated metal products in service. Critical tests by exterior exposure, salt spray, and immersion, are further means of determining quality of the coating.

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4-DU-1

A possible method of classifying the presence and extent of spot weld defects revealed by radiography by which observations from spot weld radiographs could be recorded and transmitted from one individual to another. Punch card system for filing radiographic data.

12-49. Taper Production, Gaging and Gages. W. Richards. *Machinery (London)*, v. 70, Jan. 16, 1947, p. 67-72.

Construction and application of the Universal taper-measuring gage.

12-50. Radiography of Captured Enemy Equipment by the U. S. Navy. Donald T. O'Connor. *Industrial Radiography & Non-Destructive Testing*, v. 5, Winter 1946-1947, p. 6-10.

Radiographic instruments and their application at the Ordnance Investigation Laboratory at Indian Head, Md.

12-51. Radon Leakage From Navy Radium Capsules. Herman F. Kaiser. *Industrial Radiography & Non-Destructive Testing*, v. 5, Winter 1946-1947, p. 11-17.

A series of field and laboratory tests to determine the extent of radon leakage in radium capsules. Majority of the capsules tested showed leakage to a greater or less extent. Tests were carried out to determine best means of sealing leaking capsules in steel cartridges. These showed that this may best be done by solder sealing the steel cartridges. The internal cavity of the cartridge must be kept to a minimum to avoid loss of radiographic definition.

12-52. Fluoroscopic Examination of Metallic Objects. B. Cassen and D. S. Clark. *Industrial Radiography & Non-Destructive Testing*, v. 5, Winter 1946-1947, p. 34-37.

An investigation undertaken at California Institute of Technology to determine the limitations and the reliability of fluoroscopic methods of examination of metallic materials; comparison with radiographic methods; as a supplement to or replacement for radiography of metallic materials; and to extend the field of usefulness of fluoroscopy by improvement in equipment and technique.

12-53. An Integrating Photometer to Measure Porosity in Castings. Edward I. Salkovitz. *Industrial Radiography & Non-Destructive Testing*, v. 5, Winter 1946-1947, p. 38-40.

An integrating photometer could be used to measure directly the degree of porosity indicated in a radiograph. Theory, construction, calibration, operation, and alternative construction.

12-54. Inspection Efficiency and Sampling Inspection Plans. Marvin Lavin. *Journal of the American Statistical Association*, v. 41, Dec. 1946, p. 432-438.

Published sampling inspection plans contain the assumption that inspection is completely efficient, that is, that the items examined are invariably classified correctly. Some contributing factors to lack of inspection efficiency are noted, and an analysis of the validity of the guarantees of the plans in the presence of inspection error.

12-55. The Marginal Zones of the Plates for Locomotive Boilers. M. P. Jourmat. *Engineers' Digest (American Edition)*, v. 4, Feb. 1947, p. 91.

Specifications governing acceptance of boiler plates by French National Railways. Non-normalized plates are permitted, provided they pass certain tests. There is danger of recrystallization of the marginal zones to coarse grains, during boiler construction or service. This will take place in the hot zones when plates of fine grain structure are used. Recommends addition of micrographic test to present test procedures, or better, prohibition of use of non-normalized plates. (Condensed from *Revue Générale des Chemins de Fer*, France, v. 65, Nov. 1946, p. 195-197.)

12-56. Precision Measurement. Section II. Part IX. Warren Baker. *Machine and Tool Blue Book*, v. 43, March 1947, p. 190, 192, 197, 199-202, 204.

Inspection of the cylindrical, square, flats, straight edges and parallels. Methods of procedure and the tools necessary to perform accurate inspection jobs.

12-57. Starts Standardization of Stainless Pipe & Fittings. *Heating, Piping & Air Conditioning*, v. 19, March 1947, p. 89-90.

Recent report of Standardization Committee of the Heating, Piping and Air Conditioning Contractors National Association.

12-58. Statistical Engineering. Robert C. Tumbleson. *Federal Science Progress*, v. 1, April 1947, p. 37-40.

Newer techniques in tolerance specifications, quality control, acceptance sampling, and performance studies. Quality control charts of Brinell hardness, and graphs showing relationships between Brinell hardness, yield point, and tensile strength.

For additional annotations indexed in other sections, see:
3-58-73; 4-22-24-25; 7-68; 9-31; 14-65; 20-108-130; 27-59.

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13 PYROMETRY Temperature Control

13-6. A Photographic Investigation of the Brightness Temperatures of Liquid Steel Streams. J. A. Hall. *Journal of the Iron and Steel Institute*, v. 155, Jan. 1947, p. 55-85.

Motion pictures were taken of molten steel in tapping and casting operations. A density-temperature calibration of the film was made in order to investigate the relationships of brightness and temperature. Optical pyrometer observations on a flickering field or on a nonuniform field are likely to be about 10° C. higher than actual temperatures. Better agreement between optical pyrometer values and photographic values was obtained with casting than with tapping streams. Use of a pyrometer with a larger field of view than the normal disappearing filament type is recommended.

13-7. Selection and Installation of Thermocouple Extension Lead Wire. *Iron Age*, v. 159, March 6, 1947, p. 82-84.

The various factors governing selection of the proper kind of lead wire and a few simple rules to be followed in order to insure accurate measurement and control.

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14 FOUNDRY PRACTICE

14-60. Precision Comes to the Foundry. *Machinery (London)*, v. 70, Jan. 30, 1947, p. 147-148.

Development of improved zinc alloys and structural applications of die castings.

14-61. Malleable Cast Iron. (Concluded.) H. G. Hall. *Foundry Trade Journal*, v. 81, Jan. 30, 1947, p. 99-104.

Malleable iron theory and practice. Cooling through the critical range; gas annealing; effects of certain elements on graphitization rate; residual elements. Two unusual processes whereby malleable cast iron of superior properties may be produced.

14-62. The Centrifugal Casting of Brass (63:37) Ingots for Subsequent Cold Rolling. T. B. Crow. *Metallurgia*, v. 35, Jan. 1947, p. 141-146.

Experimental investigation carried out with a full-sized specially-constructed production unit into the possibility of casting brass (63:37) ingots for subsequent cold rolling into finished strip. Objects of the research; description of the plant; casting process; examination of the castings; machining the castings; rolling the castings; tests on finished strip; the future.

14-63. Production of Magnesium Sand Castings. G. B. Partridge. *Metallurgia*, v. 35, Jan. 1947, p. 147-152.

In designing a modern magnesium foundry sections are partitioned off to effect good working conditions and also to facilitate production. Methods applied; preparation of molding sand for magnesium alloy castings; preparation of molds; use of chills; ingates, runners and risers.

14-64. German Production of Spun Pipe. M. M. Hallett. *Foundry Trade Journal*, v. 81, Feb. 6, 1947, p. 136-138.

Practice at Gelsenkirchen, Wetzlar and Brebach-Saar. (Extracted from B.I.O.S. Final Report No. 700, "The German Centrifugal Castings Industry," by permission of the Controller of H.M. Stationery Office.)

14-65. Density Measurements. W. T. Pell-Walpole. *Metal Industry*, v. 70, Feb. 14, 1947, p. 123-125.

Usefulness of measurement of density as a routine control method, particularly for the control of batches of bronze castings of the same size, form and composition.

14-66. Efficient Salvage of Porous Castings. H. W. E. Riley. *Modern Metals*, v 3, Feb. 1947, p. 20-21.

Method which utilizes synthetics to produce a sealant which is practical and acceptable for most types of pressure-tight casting requirements.

14-67. What Kind of Pattern? *Foundry*, v. 75, March 1947, p. 70-71.

First of three articles describing the type of pattern equipment recommended for use in producing various quantities of different size castings—patterns for castings whose largest dimension is less than 24 in.

14-68. Modern Melting Methods for Malleable Foundries. W. R. Jaeschke. *Foundry*, v. 75, March 1947, p. 72-75, 202-204, 206, 208, 212, 214, 216.

Duplexing operations, slag removal by sluicing with water, pulverized-coal firing, air preheating, sand-bed preparation.

14-69. Ventilating Screens, Breakers, Mullers. *Foundry*, v. 75, March 1947, p. 76-77, 229-231.

Equipment used in the continuous sand systems of mechanized foundries.

14-70. Brass and Bronze Foundry Practice. D. Frank O'Connor. *Foundry*, v. 75, March 1947, p. 105, 172, 174, 176, 178, 180.

Practical methods in the production of brass and bronze castings are detailed in paper presented before the Chesapeake Chapter, American Foundrymen's Association.

14-71. Sands for Heavy Steel Castings. D. J. Taylor. *Foundry*, v. 75, March 1947, p. 106-107, 129.

Factors influencing the selection of sands for heavy steel castings; spalling; properties and chemistry of silica sand; action of fluxes in production of high-temperature castings. (Presented at A.F.A. Regional Foundrymen's Conference, Philadelphia, Nov. 1946.)

(Turn to page 32)

Objectives of Foundry Technology Realized by Some War Developments

Reported by James M. Taub
Group Leader, Los Alamos Laboratory

The primary objectives of foundry technology were stated briefly as an introduction to a talk on "Castings Technology During the War Years" presented by Kenneth L. Clark before the Los Alamos Chapter on Jan. 28. Mr. Clark, who was formerly with the Naval Research Laboratory, is now a member of the staff at the Los Alamos Laboratory.

Chief among these objectives, he said, is the production of castings to a specified composition and without gross surface imperfections, hot cracks, shrinkage and microporosity. These objectives are realized by applying knowledge of metallurgy, molding sand, casting design, gating, risering, application of chills and manipulation of molds, so that castings are made satisfactorily with a minimum of manpower and expense.

Some important developments during the war years included such topics as sand practice, investment precision casting procedures, castings made in plaster, insulating riser sleeves, controlled directional solidification, chills and antichills, effect of atmospheric pressure on castings, centrifugal castings and inspection methods.

The trend is now toward the use of synthetic sand, Mr. Clark pointed out. Precision casting techniques have been highly developed and used primarily for jet-engine components.

Plaster molds and insulating riser sleeves have been used extensively for casting copper-base alloys and improved cast structures and mechanical properties are obtained by controlling thermal gradients during cooling. The Williams core was determined to be effective in equalizing the pressure within the molten metal and the atmosphere. Variation in external and internal pressures may cause the walls of castings to collapse during solidification.

The lecture was accompanied by slides, and an impressive series demonstrated the effect of thermal gradients during cooling on the structure and properties of castings.

To Manage Texas Office

H. B. Lilley, Timken development engineer on alloy mechanical tubing, has recently been appointed district manager of the Timken Steel and Tube Division with headquarters in Houston, Texas. His territory will include Texas, Louisiana, Arkansas, Oklahoma, and Kansas.

Hegel and Queen Succeed Van Dyke at Ryerson

Appointment of Charles S. Hegel as manager of the stainless steel division, and John W. Queen as manager of the alloy steel division has been announced by Joseph T. Ryerson & Son, Inc., Chicago. G. Van Dyke, former head of the Ryerson special steels division, retired Dec. 31, 1946, after 30 years' service with the organization.

G. Van Dyke C. S. Hegel J. W. Queen

Mr. Hegel has been associated with Ryerson since 1928, and has been manager of the special steels department in the Chicago plant since 1945. Mr. Queen joined the organization in 1933 and was manager of the alloy steel department at New York since 1934. He was chairman of the New Jersey Chapter in 1942-43 and chairman of the society's National Constitution and Bylaws Committee in 1943-44.

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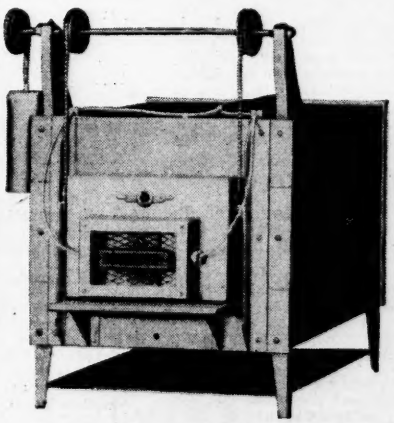

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14-72. New Lifting Device Simplifies Mold Weight Handling. William K. Mitchell. *Foundry*, v. 75, March 1947, p. 146, 148.

Compressed-air lifting device used for lifting weights from molds.

14-73. Formulas for Determining the Weights of Castings. (Continued.) *Foundry*, v. 75, March 1947, p. 151-152.

Tables and formulas for: sector of a ring of circular cross section; irregular castings which cannot be divided into elementary solids; hollow spherical wedge; sector of a ring made by cutting a cylindrical hole through the center of a sphere; segment of a ring of triangular cross section. (To be continued.)

14-74. 1947 Inventory of Foundry Equipment. *Foundry*, v. 75, March 1947, p. S1-S24.

Study of the distribution and age of foundry equipment is based on confidential reports from more than 1500 foundries throughout the United States and Canada. Contains the following sections: operating outlook; foundry capacity; modernization; melting furnaces; materials handling; sand equipment; other equipment; equipment buying.

14-75. Malleable Cast Iron. (Continued.) H. G. Hall. *Foundry Trade Journal*, v. 81, Jan. 23, 1947, p. 75-79.

Fundamental discussion of theory and practice in casting of malleable iron. Extensive information concerning the structural changes which take place.

14-76. Fuel Economy and Melting. F. A. Allen. *Light Metals*, v. 10, Feb. 1947, p. 69-73.

Light metal melting equipment and a recently developed furnace.

14-77. Aluminum Foundry Sands and Binders. Hiram Brown. *Light Metal Age*, v. 5, Feb. 1947, p. 16-21.

Different types of sands, their origin, composition, size, and shape. Clay materials, their use and effect in sand mixes. Functions and importance of water. Core binders and their good and bad features. Gas tests to determine how much and how rapidly gas is evolved from the various binders, and the importance of these results.

14-78. Unsoundness in Cast Light Alloys. Part II. *American Foundryman*, v. 11, Feb. 1947, p. 35-47.

Concluding installment of A.F.A. committee report covers effect of solidification rate and gas content; effect of grain size; effect of A.F.A. permeability and moisture content of the molding sand; and relation of pinhole porosity to microporosity. Many radiographs and micrographs.

14-79. Making Permanent Molds. Vincent J. Sedlon. *American Foundryman*, v. 11, Feb. 1947, p. 49-54.

An outline of the skills and facilities necessary for successful production of permanent molds for aluminum castings. Problems encountered.

14-80. Aluminum Hand Truck Cast in Permanent Mold. H. R. Noyes. *Iron Age*, v. 159, March 6, 1947, p. 72-73.

Some of the engineering problems involved and how they were solved.

14-81. La Fabrication des Pièces en Acier Moulé Destinees aux Constructions Aéronautiques. (Production of Steel Castings for Aircraft Construction.) R. Buquet. *Fonderie*, Dec. 1946, p. 397-415.

Applications, methods of casting, and final treatment in U.S.A., England, and Germany.

14-82. De Koepeloven. (The Cupola.) J. S. Abcouwer. *Metalen*, v. 1, Feb. 1947, p. 93-99.

Factors controlling iron smelting in a cupola. The importance of operational equilibrium conditions. The diagram recommended by Ralph Knight in 1926 for judging the coke bed is recommended. 49 ref.

14-83. Centrifugal Casting. L. Northcott. *Foundry Trade Journal*, v. 81, Feb. 13, 1947, p. 151-155.

Machine design, German developments, metallurgical features, and mathematics of the process.

14-84. Mare Island's Accurate Method of Propeller Manufacture. Milton M. Metcalf. *Journal of the American Society of Naval Engineers*, v. 59, Feb. 1947, p. 33-42.

Techniques developed by the Navy for casting of giant manganese-bronze propellers. Illustrated.

14-85. Timer for Die-Casting Machine. Gerald Delong. *Electronics*, v. 20, March 1947, p. 110-111.

Accuracy and efficiency of die casting with aluminum and zinc are obtained by an electronic timer that determines the interval between the shot or molding action and the ejection of the casting from the mold.

14-86. The Manufacture of Precision Castings. Part II. G. Vennerholm and E. Ensign. *Tool & Die Journal*, v. 12, March 1947, p. 72-77, 132-135.

Investment molding and plaster molding methods.

14-87. Plate Performance as Affected by Die Casting Quality. E. A. Anderson. *Die Castings*, v. 5, March 1947, p. 56, 58.

Poor protection sometimes afforded by the plating material is often caused by defective castings. Micrographs.

14-88. Manufacture of Zinc-Base Alloy Die Castings. J. C. Fox. *Monthly Review*, v. 34, March 1947, p. 288-297.

Special high grade zinc; composition of zinc-base alloys; microstructure of zinc-aluminum alloys; casting practice; die-casting machines; dies; design features of zinc die castings; die steels.

14-89. Modern Foundry Equipment Produces Quality Castings. Arthur Q. Smith. *Industrial Gas*, v. 25, March 1947, p. 17, 32-33.

Procedures and equipment at Hampden Brass and Aluminum Co., Springfield, Mass., for production of nonferrous castings.

For additional annotations indexed in other sections, see:
2-26-32; 3-66-67; 4-20-26-30; 7-86; 9-33; 10-40; 16-26-28; 23-67-75; 24-81; 26-39.

15 SALVAGE AND SECONDARY METALS

15-7. Scrap Metals. Charles White Merrill, Herbert L. Cullen and Norwood B. Melcher. *Mining Congress Journal*, v. 33, Feb. 1947, p. 98-101.

1946 developments and 1947 trends.

15-8. Nassau—The Bell System's Conservation Specialist. William A. Scheuch. *Bell Telephone Magazine*, v. 25, Winter 1946-1947, p. 256-266.

The ways in which Nassau Smelting and Refining Co., a subsidiary of Western Electric Co., reclaims millions of pounds of metals and other materials from Bell system operations.

15-9. How Ford Salvages Waste. *Machine and Tool Blue Book*, v. 43, March 1947, p. 172-176, 178, 180.

Methods employed at the Ford Motor Co. to salvage rubber articles, drills, hammers, grinding wheels, paper and wooden blocks.

For additional annotations indexed in other sections, see:
7-88.

16 FURNACES AND FUELS

16-26. Crucible Furnaces. (Continued.) J. G. McDonnell. *Metal Industry*, v. 70, Feb. 7, 1947, p. 103-105.

A power-tilted lip axis furnace and a crucible furnace on the same principle as the open-flame "concrete mixer" type of rotary furnace. (To be concluded.)

16-27. Improved Design of Metallic Recuperator. Frank D. Hazen. *Iron and Steel Engineer*, v. 24, Feb. 1947, p. 59-63; discussion, p. 63-64.

Design and advantages of metallic recuperators for industrial furnaces such as for slab and billet heating.

16-28. How to Use Less Coke. *Foundry*, v. 75, March 1947, p. 78-80, 232, 234.

Four letters received in answer to an invitation to readers to submit recommendations for most economical use of cupola fuel.

16-29. The Operation of Openhearth Furnaces With Coke-Oven Gas. D. Kilby. *Journal of the Iron and Steel Institute*, v. 155, Jan. 1947, p. 3-20.

Operation of English 100-ton basic openhearth furnaces at a certain plant, which are fired with coke-oven gas and pitch creosote.

16-30. The Blast Furnace of Today. Part I. A Review of Current Furnace Engineering. W. R. Brown. *Journal of the Iron and Steel Institute*, v. 155, Jan. 1947, p. 107-115.

Developments which have led to the British blast furnace of today. Photographs and illustrations.

16-31. The Blast Furnace of Today. Part II. A Commentary on Current Furnace Engineering. I. S. Scott-Maxwell. *Journal of the Iron and Steel Institute*, v. 155, Jan. 1947, p. 115-120.

Layout and economic operation; material handling and preparation; furnace stack and top gear; auxiliaries.

16-32. Liquid Fuel. C. Croxford. *Iron and Steel*, v. 20, Feb. 1947, p. 49-53.

Disadvantages of gas firing; the use of liquid fuels, with or without gas; the advantages of liquid fuels; training of men; supply of fuel to the furnaces. (To be concluded.)

16-33. The Infrared Gas Burner. L. Sanderson. *Metallurgia*, v. 35, Feb. 1947, p. 187-189.

A recent development in gas burners of the infrared type. One of the latest types of these burners has a refractory surface, which is kept brilliantly radiant from which a uniform temperature is obtained. Constructional principles involved.

16-34. The Use of Low-Frequency Electric Induction Furnace for the Melting of Aluminum Alloys. S. Boxall. *Metallurgia*, v. 35, Feb. 1947, p. 205-206.

Advantages and disadvantages of melting aluminum alloys in the low-frequency induction furnace. There are no products of combustion; thus, hydrogen, which is present in fuel gases, is not likely to contaminate the charge. The rotary motion imported by the furnace reduces the possibility of segregation, and the temperature can be controlled within fine limits. In addition, the furnace is clean in operation, and melting losses are low.

16-35. Enameling Furnaces Increase Production in St. Louis Stove Plant. Robert Latimer. *Industrial Gas*, v. 25, Feb. 1947, p. 18, 22.

Furnaces and enameling techniques used by American Stove Co. in St. Louis.

16-36. Heating With Microwaves. J. Marcum and T. P. Kinn. *Electronics*, v. 20, March 1947, p. 82-85.

Methods of utilizing wave guides for

(Turn to page 34)

Production Control Chart Insures Best Steelmaking Practice

Reported by M. W. Williams
Foundry Manager, Hughes Tool Co.

Problems involved in the control of uniformity of steel from heat to heat and methods used for combating these problems were described by A. N. Swanson, chief process metallurgist, Chicago District, Carnegie-Illinois Steel Corp., before the Texas Chapter ⚙ on Jan. 21. His subject was "Uniformity of Steel Quality—the Problem of Process Metallurgy". Variables begin with the raw materials and follow through all steelmaking processes to the finished product, he pointed out.

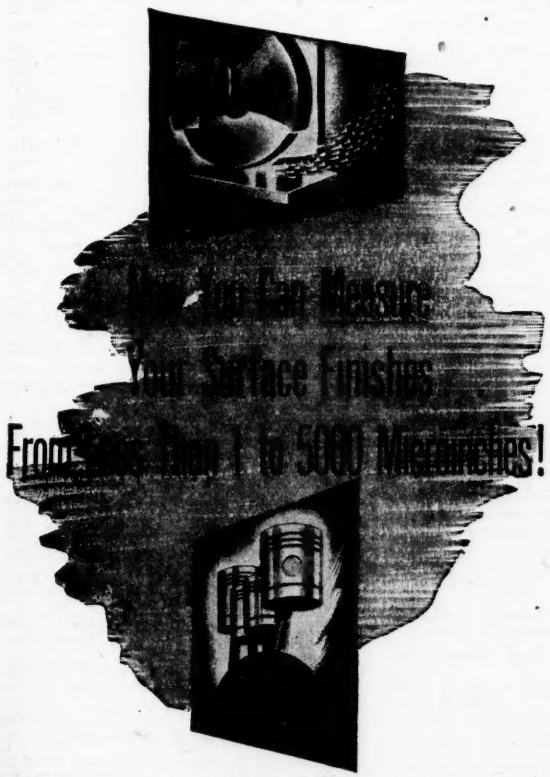
Raw material variables change with the chemical content of the coal, coke, ore, lime and other products used in the blast furnace for the production of pig iron. In the blast furnace additional variables such as temperature and percent of moisture in the air, and analysis of slag and iron make the operations increasingly difficult to control. When the iron enters the openhearth the number of materials increases, thereby increasing the possibility of variations in the steel quality.

Mr. Swanson described a production control chart which is used by his company to regulate temperature, deoxidation practice, slag balance and other operations. This chart outlines the best available steelmaking practices. He also stressed the danger in letting a practice become fixed or permanent, for new methods are constantly being developed; such new methods are added to the production control charts.

These charts are used for the production of pig iron, openhearth operations, soaking pit operations, rolling mill practice, cooling cycles and finally the finishing mills. Best standard practices known are followed in order to produce a good quality of steel to meet today's specifications.

Boegehold at Boston

Paul D. Ffield (Left), Chairman of the Boston Chapter ⚙, Welcomes National President A. L. Boegehold, Head of the Department of Metallurgy, Research Laboratories Division of General Motors Corp. Dr. Boegehold spoke on "Correlation of Recent Data on Hardenability" before the January meeting. (Photo by H. L. Phillips)



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For additional annotations indexed in other sections, see:
2-47-48; 7-103; 14-68-76; 17-16-17; 18-57-59.

17 REFRACTORIES
Furnace Materials

17-16. Measuring Stick for the Life of a Blast Furnace Lining. F. E. Kling. *Blast Furnace and Steel Plant*, v. 35, Feb. 1947, p. 215-216.

Method of calculation based on number of days of operation.

17-17. Refractory Applications for Acid Openhearth Furnaces. R. Russell Fayles. *Blast Furnace and Steel Plant*, v. 35, Feb. 1947, p. 217-219.

Refractory experimentation on an acid furnace which has improved both furnace operation and refractory performance. Furnace under discussion is an oil-fired unit tapping about 60 net tons of ingots. All heats are low-carbon rimmed steel, bottom-poured, for direct rolling into plates. The charge is normally composed of 20% cast iron and molds, with the remaining 80% of low-carbon home plate scrap. Heats normally will show about 0.30% carbon on the first test and will be at around 0.10% carbon when tapped, having had about 500 lb. of ore worked through the heats during the refining period.

17-18. Acid Heat Resistant Solution for the Quartzite Masonry of Refractory Furnaces. S. S. Bermant. *Reports of the Academy of Sciences of U.S.S.R.*, v. 54, Dec. 21, 1946, p. 811-812. (In Russian.)

Proposes the use of marchalite (84.62% SiO_2; 0.73% Fe_2O_3; 9.56% Al_2O_3; 1.24% CaO; and 0.23% MgO) in combination with a sulphite-cellulose extract as mortar for joining high-temperature refractories.

17-19. Vermiculite Insulating Brick. Robert F. Rea. *American Ceramic Society Bulletin*, v. 26, Feb. 15, 1947, p. 36-38.

The development of vermiculite insulating brick. The product containing 25% colloidal magnesium silicate, Eyrite, will pass the A.S.T.M. reheat specifications for a 2000° F. class brick. The initial firing shrinkage is approximately 2%.

17-20. A New Highly Refractory Material "Thermitomullite". R. L. Pevzner. *Bulletin of the Academy of Sciences of U.S.S.R.*, Section of Technical Sciences, no. 10, 1946, p. 1431-1437. (In Russian.)

A new highly heat resistant refractory material produced from mullite, using the new improved thermit method of Goldschmidt. This material contains 22.18% SiO_2, 74.86% Al_2O_3, 1.45% MnO, 0.32% MgO, 0.52% CaO, and 0.60% K_2O; is gray in color, and has a compression strength of over 2000 kg. per sq. cm. and heat resistance above 1800° C.

17-21. Rammed Refractories in Electric Furnaces. Robert H. Zoller. *Brick & Clay Record*, v. 110, March 1947, p. 72, 74, 76.

Selecting a refractory for the job; developing routine methods for installation; preparing the unit for service.

17-22. Plastic Lined Openhearth Doors Give Longer Life and Reduce Furnace Cooling. J. N. Hornak. *Brick & Clay Record*, v. 110, March 1947, p. 76, 78.

Experiments indicate that they require less crane time and maintenance. For economic use, they must have life ratio of 10 to 1 over brick-lined doors.

17-23. New Castable Refractory Withstands 3000° F. *Iron Age*, v. 159, March 20, 1947, p. 45.

Kaocast is said to withstand temperatures as high as 3000° F. and shows excellent stability and resistance to spalling under repeated heating and cooling cycles. Other features of Kaocast include its very small volume change on initial firing and its lack of shrinkage or expansion under continuous use at high temperatures.

18 HEAT TREATMENT

18-41. Quenching of Toolsteels. E. F. Watson. *Machinery (London)*, v. 70, Jan. 30, 1947, p. 139.

Oil quenching, salt quenching and air blast.

18-42. A Model Which Shows Hardening and Annealing Mechanisms. Edwin C. Davis. *Metal Progress*, v. 51, Feb. 1947, p. 248-249.

Experiments with various sizes and curvatures of watch glass, various sizes of shot, and different methods of agitating the glass to demonstrate the processes of slip, slip interference, cold work, and annealing.

18-43. Cooling Time of Jominy Bars to Half-Temperature. Carl A. Liedholm. *Metal Progress*, v. 51, Feb. 1947, p. 266-267.

Observed values of half-temperature cooling times along Jominy bar and their relation to a curve calculated from a modified Gompertz equation.

18-44. Maximum Sizes of Bars of Required As-Quenched Center Hardness (H Sizes). A. L. Boegehold. *Metal Progress*, v. 51, Feb. 1947, p. 272-B.

Hardenability tables for given percent of martensite, after oil and water quench, of various steels.

18-45. Heat Treating—Additions to Metallurgical Knowledge During the Past Year. G. K. Manning. *Metals Review*, v. 20, Jan. 1947, p. 5-8.

Developments reported in the literature during 1946. These are discussed under the headings: austenite decomposition, induction heating, overheating, and carburization.

18-46. Products and Processes for Heat Treating. *Metals Review*, v. 20, Jan. 1947, p. 9, 11, 13, 15, 17, 19, 45.

Some recent innovations in equipment. List of names and addresses of manufacturers in this field.

18-47. Suspended Carburization. S. L. Widrig, John E. Reed, and O. E. Cullen. *Materials & Methods*, v. 25, Feb. 1947, p. 65-68.

Method for holding charges in gas carburizing furnaces up to 72 hr., eliminating furnace shutdowns for week ends.

18-48. Caustic Soda Solutions. *Materials & Methods*, v. 25, Feb. 1947, p. 123.

Table and graph to help make up solutions by weight to desired strengths, or to check solutions already made up, using a hydrometer reading in either specific gravity or Baumé degrees. Solutions used for quenching steel forgings and other work.

18-49. Precipitation Hardening. L. Sanderson. *Chemical Age*, v. 56, Feb. 1, 1947, p. 202-204.

Essential requirements; stability hardening; heat treatment; quenching media; formation of nuclei. (To be continued.)

18-50. Heat Treatment of High Speed Steels. Part I. Howard E. Boyer. *Steel*, v. 120, March 3, 1947, p. 110-113, 138, 140.

Fundamental information of practical value to heat treaters as well as to the user of high speed steel tools. Results of an exhaustive study of the properties obtainable from three different types of high speed steels. (To be continued.)

18-51. Metals Plus Hydrogen. Howard C. E. Johnson. *Scientific American*, v. 176, March 1947, p. 116-118.

The various hydrides and their application to metal treating processes.

18-52. Heat Treatment of High Speed Steels. (Concluded.) Howard E. Boyer. *Steel*, v. 120, March 10, 1947, p. 92-95, 120, 123, 126.

Data related to the tempering operations and the physical changes involved. Transformation of austenite in most steels is completed in less time than some former investigations have shown; major portion of transformation takes place during heating to the tempering temperature.

18-53. The Izod Impact Strength of Heat Treated Alloy Steel. Walter Crafts and John L. Lamont. *Metals Technology*, v. 14, Feb. 1947, T. P. No. 2134, 15 p.

Study was conducted in order to develop a basis for estimating the Izod impact strength of partially hardened steel; based on test data derived from 24 heats from four producers.

18-54. Surface Hardening of Aluminum and Its Alloys. K. G. Robinson and B. W. Mott. *Metallurgia*, v. 35, Feb. 1947, p. 201-204

Work was carried out to produce a suitable surface layer of copper-rich constituent and, by careful control of conditions, a hard surface layer of good uniformity was produced.

18-55. The Interrupted Quench and Its Practical Aspects. Howard E. Boyer. *Steel Processing*, v. 33, Feb. 1947, p. 103-110.

Results of an investigation to determine causes of cracking of S.A.E. 52100 when martempered. Factors investigated were carburizing atmospheres; decarburizing atmospheres; overheating; underheating; effects of agitation in martempering bath; chemical composition of salt quenching bath; Ms point location; hardenability—martempering versus oil quenching; holding time in the martempering bath; cooling rate from martempering bath; percentage of retained austenite—martempering versus oil quenching.

18-56. Controlled Atmosphere Aids Bulova. Oliver Pritchard. *Industrial Gas* v. 25, March 1947, p. 7-9.

Controlled atmospheres used in the heat treating of watch parts.

18-57. Defiance Screw Machine Has Complete Heat Treating Department. *Industrial Gas*, v. 25, March 1947, p. 10-11.

Heat treating equipment at Defiance Screw Machine Products Co., Defiance, Ohio.

18-58. Gas Toughens the Tractor. William Helme. *Industrial Gas*, v. 25, March 1947, p. 14-16, 34.

Heat treating equipment and procedures used by International Harvester Co. in their Chicago plant, for manufacture of tractor parts.

18-59. Metal Heat Treating Equipment. Gordon Wheeler. *Machine and Tool Blue Book*, v. 43, March 1947, p. 206-208, 210, 212, 214-216, 218, 220, 222-224, 226, 228.

Analyzes three methods of heat transfer—conduction, convection, and radiation—and the types of equipment designed to accomplish these methods of heat transfer, such as salt baths, lead baths, semimuffle and full muffle furnaces.

18-60. You Can Profit From Flame Hardening. *Industry and Welding*, v. 21, March 1947, p. 48-50, 52.

Important factors in flame hardening; new applications where flame hardening can be used to advantage.

For additional annotations indexed in other sections, see:
3-55-60-68-81; 4-21; 12-41; 22-115; 25-31; 27-54.
(Turn to page 36)

Hastelloys and Stellites for Service At High Temperatures Are Described

Left to Right Are William Mudge, Chairman, New York Chapter; F. S. Badger, Speaker on Alloys for Gas Turbines; and Howard Avery of American Brake Shoe Co., Who Acted as Technical Chairman of the Meeting

Reported by E. M. Sherwood
Metallurgist
Sperry Gyroscope Co., Inc.

The high-temperature alloys for gas turbines described by F. S. Badger of the Haynes Stellite Co. before the New York Chapter on Jan. 6 are not new but their applications are, he pointed out. The principal use is for turbine blading. The N.D.R.C. and N.A.C.A. sponsored a great deal of research on these alloys during the war, in the course of which much new test data were assembled.

The alloys discussed for high-temperature service are of two types—the Hastelloys, which have a nickel base, and the stellites, which have a cobalt base. A chart was distributed which summarized the chemical compositions in the two classes.

Mr. Badger presented microstructure and X-ray diffraction data for the stellites. When an alloy in the as-cast condition showed an X-ray diffraction pattern indicating the presence of some hexagonal close-packed cubic cobalt structure, the microstructure indicated the presence of a eutectoid.

The cobalt alloys are very sensitive to cold work, even that caused by metallographic polishing. The Widmanstätten structure on ground or sand-blasted precision-cast alloys persists to a depth of 0.003 in. An anneal at 2100° F. is given to erase this effect.

The speaker was of the opinion that a fine grain is not necessarily the best structure in high-temperature alloys. In general, precision-cast parts have reasonably large grain structure, but where the section of the part is thin, even with the heated molds used in precision casting, the metal cools rapidly enough to give relatively fine grain structure.

Choice of a material for a particular service depends on the aging characteristics of that material, he pointed out. In order to evaluate these, it is necessary to know the effect of aging on both the short-time and creep properties.

Many slides were shown illustrating the type of parts made and microstructures of the alloys.

Toolsteel Melting & Finishing Traced

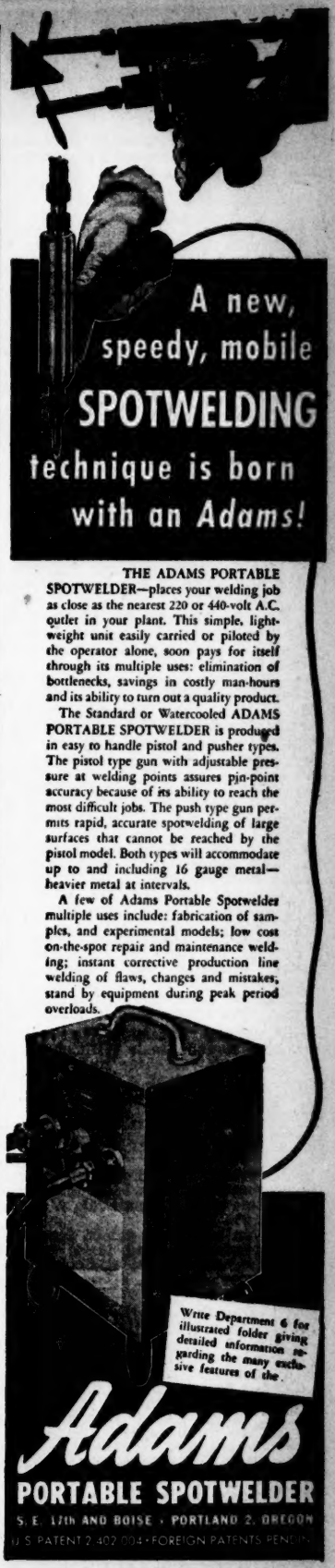
Reported by Knox A. Powell
Research Engineer
Minneapolis-Moline Power Implement Co.

A down-to-earth talk on toolsteel ranging from manufacture and manufacturing inspection to failures and their causes and cures was presented by W. A. Schlegel of Carpenter Steel Co., to the Northwest Chapter on March 11.

The manufacture of toolsteel starts with the careful segregation of melting scrap, according to Mr. Schlegel. After electric furnace melting, it is finished by a double reduction, first with a roll or hammer, and, after reheating, it is further refined by rolling to finished size.

Mr. Schlegel outlined the temperature requirements for heat treating carbon and alloy toolsteels, and indicated the varying effect of oxidizing and reducing furnace atmospheres with different alloy and carbon content. He explained the simple wood block test for furnace atmosphere, and pointed out that steels hardening from 1700° F. or lower generally require slightly oxidizing atmospheres, although steels hardening from higher temperatures require somewhat reducing atmospheres.

Discussion brought out that a high-carbon toolsteel in which the austenitic transfer cannot be completed at atmospheric temperature is sometimes improved by cold treatment. Austenitic transformation can be advanced by repeated drawing, but only with a loss in hardness, which is avoided in cold treatment.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19 WORKING — Rolling, Drawing, Forging

19-63. Improved Production of Seamless Conical Tubes. *Machinery (London)*, v. 70, Jan. 23, 1947, p. 119-120.

Instead of consistently expanding the tube by direct full-length passes of the internal mandrel and outer roll disks mounted on a suitable carriage, this work is only carried out so far as to provide a tube with sectional reductions, that is, with shoulders. The shouldered tube is then pulled through a pair of specially constructed rollers, having a conical pass groove, whereby at a single draw it is converted to the finished conical tube.

19-64. Cylinder Liner Production. *Machinery (London)*, v. 70, Jan. 23, 1947, p. 99-105; Feb. 6, 1947, p. 171-173.

Methods employed at Ford Motor Co. for drawing, trimming, and flanging of engine cylinder liners made from sheet steel blanks. Heat treatment, burnishing, and finish honing operations.

19-65. Presses Set Pace for Fuel Tank Production Line. P. D. Aird. *Modern Industrial Press*, v. 9, Feb. 1947, p. 13-14, 26.

Manufacturing methods followed in the production of the Ford passenger car fuel tank.

19-66. The Manufacture of Food Machinery—Becoming a Major Industry. Thomas A. Dickinson. *Modern Industrial Press*, v. 9, Feb. 1947, p. 22, 24, 26.

Equipment and procedures at Food Machinery Corp.

19-67. Engineering Research Pays Off in the Manufacture of Steel Stall Shower Cabinets at Tiletone Co., Chicago. *Modern Industrial Press*, v. 9, Feb. 1947, p. 40, 44, 46.

Some of the operations involved in their production demonstrating development of "oil can" action and trim die for press.

19-68. Effect of Forging on Segregation in High Speed Steel. E. S. Kopecki. *Iron Age*, v. 159, Feb. 27, 1947, p. 42-43.

Effect of forge reduction on carbide distribution in high speed steel showing metallurgical structure correlated with X-ray examination at various degrees of reduction. Experimental work indicates that a minimum of approximately 90% in reduction of ingot bar is necessary in order to obtain satisfactory carbide distribution.

19-69. Metal Stamping Operations, Drawing Round Shells Without Flange. D. A. Rogers. *Machine and Tool Blue Book*, v. 43, Feb. 1947, p. 257-266; *Modern Industrial Press*, v. 9, Feb. 1947, p. 28, 32, 38.

The factors which govern the possible height of single-operation drawing of a shell. Charts and tables.

19-70. Production of Extremely Accurate Embossing Dies. Carl O. Malmstrom. *Machine and Tool Blue Book*, v. 43, Feb. 1947, p. 276-277.

Advantages to be gained from using the pantograph and metal spraying method of making embossing dies. Equipment needed. Cost and time advantages.

19-71. Dimpling and Riveting. *Aircraft Production*, v. 9, Feb. 1947, p. 67.

Tool which consists of a set of ganged pistons mounted on a common piston rod which transmits load to a head- or dimple-forming plunger. This is carried in one of a pair of fixed pincer-shaped jaws which are attached to the cylinder barrel by a pivoted adapter.

19-72. Thread-Rolled Cooling Fins. *Aircraft Production*, v. 9, Feb. 1947, p. 76.

German process for producing radiator elements from seamless tube. (Abstract of F.I.A.T. Report No. 582, H. M. Stationery Office.)

19-73. Constant-Tension Reel Drives. E. S. Murrah. *Blast Furnace and Steel Plant*, v. 35, Feb. 1947, p. 205-214.

Electrical circuits and mechanical features of the systems used to maintain uniform tension in sheet steel during processing, rolling or rewinding.

19-74. Hot Rolling of Iron-Carbon Alloys With Over 1.7% Carbon. E. Piwowarsky and A. Wittmoser. *Foundry Trade Journal*, v. 81, Feb. 6, 1947, p. 125-132.

Systematic experiments carried out on the various factors entering into the hot rolling of high-test cast irons. The best initial structure for cast iron of rolling quality is a ledeburitic matrix, preferably without inclusions of free carbon. Gray and mixed irons did not respond to rolling, especially in grooved rolls. Presence of graphite carbon has practically no effect on the rolling qualities of the cast irons investigated. How the mechanical properties are improved by the conditions of rolling; the relationship between mechanical properties and degree of deformation. Maximum increase in mechanical values is obtained with a deformation of between 60 and 80%.

19-75. Extrusion of Nickel Alloys. *Machinery (London)*, v. 70, Feb. 6, 1947, p. 163-170.

Equipment and procedures employed at Henry Wiggin & Co., Ltd.

19-76. Tension Sizing of Small Diameter Seamless Pipe and Tubing. *Iron and Steel Engineer*, v. 24, Feb. 1947, p. 87-97; discussion, p. 97-100, 104.

Data obtained by the stretch reducing mill committee of National Tube Co., Pittsburgh. Disadvantages of the conventional sinking-sizing process; improvements of sizing mill operation by use of tension; design features of the stretch-reducing mill; characteristics of the process developed by performance tests; factors which determine wall reduction; factors affecting end-thickening of the wall of the reduced tube; factors involved in motor design.

19-77. The Rolling of Metals: Theory and Experiment. (Continued.) Part XIV. L. R. Underwood. *Sheet Metal Industries*, v. 24, Feb. 1947, p. 299-306, 310.

Methods of calculating roll load and the rolling horsepower. Practical examples. (To be continued.)

19-78. Practical Problems of Light Presswork Production. (Continued.) J. A. Grainger. *Sheet Metal Industries*, v. 24, Feb. 1947, p. 321-328.

Classifies, illustrates and describes various mechanical presses. (To be continued.)

19-79. Metal Manipulation by Stretch Forming. R. Smith. *Sheet Metal Industries*, v. 24, Feb. 1947, p. 372-374.

A section stretching machine. Difficulty of control and modifications necessary to effect economy of material for quantity production.

19-80. Fluctuations of the Distribution of Torque Between Rolling-Mill Spindles. E. A. W. Hoff. *Journal of the Iron and Steel Institute*, v. 155, Jan. 1947, p. 51-54.

Fluctuations of torque found when the torques acting in the two connecting spindles of a two-high rolling mill were recorded separately and independently during the operation of the mill. None of the fluctuations found could have originated from the universal joints of the spindles.

19-81. Precision Forgings. Fred P. Peters. *Scientific American*, v. 176, March 1947, p. 105-107.

Operations employed to produce contoured wheel forgings. Alloys used in precision forgings.

19-82. Improvement of Creep Resistance by Cold Work. H. Zschokke. *Engineers' Digest (American Edition)*, v. 4, Feb. 1947, p. 82-85.

Influence on creep resistance at different temperatures of initial cold work was investigated for three temperature-stable Cr-Ni steels of 18-8 type. Bars rolled at varying end temperatures, with a reduction of 20% in the last pass were tested without further treatment. (Condensed from *Brown Boveri Mitteilungen*, v. 33, Sept. 1946, p. 227-233.) 15 ref.

19-83. Thread Forming in Thin Metal. Wallace C. Mills. *American Machinist*, v. 91, March 13, 1947, p. 101-104.

Rolling tools and their application to forming of threads, heads and knurls.

19-84. Variable-Speed Press Jumps Output. Joseph I. Karash. *American Machinist*, v. 91, March 13, 1947, p. 112-115.

Practice whereby adjustable-speed drive applied to inclined punch press gives two to three times unit production with repeat-stroke operation and properly designed dies.

19-85. Wire Rod Rolling. *Wire Industry*, v. 14, Feb. 1947, p. 93-94.

Description of Hermann Goring Werke A.G. at Salzgitter taken from the B.I.O.S. Final Report No. 625, "German Wire Rod Milling Industry."

19-86. Form Tools. (Continued.) William F. Walker. *Edgar Allen News*, v. 25, Feb. 1947, p. 762-764.

Composite tools—tools with carbon steel shanks and ends of high speed steel welded to the shank. (To be continued.)

19-87. Extrusion of Magnesium. C. S. Harris. *Machinery*, v. 53, March 1947, p. 143-152.

Methods of producing extended parts in various shapes from a huge 5500-ton press and other extrusion presses at the Dow Chemical Co.

19-88. Automatic Forming and Assembling of Condenser Fins. Charles H. Wick. *Machinery*, v. 53, March 1947, p. 165-171.

Hubs of condenser fins are pierced and drawn, and the fins are sheared from strip stock and pressed with the correct spacing on U-tubes by means of an automatic machine. Increased production and a great saving in labor have been effected by this method of assembly, which requires only one operator to attend each machine. Previously, ten operators were needed to produce an equal number of condensers.

For additional annotations indexed in other sections, see:
3-60-63; 12-47; 14-64; 21-21; 22-151; 23-75; 24-67-76-86; 25-40.

20 MACHINING AND MACHINE TOOLS

20-94. Wet Turning With Cemented Carbide Tools. W. Iwascheff. *Machinery (London)*, v. 70, Jan. 23, 1947, p. 112-113.

Experiments undertaken in Germany during the war on shell turning operations. Shell forgings were turned at a cutting speed of 260 ft. per min. with a feed of 0.03 in., and depths of cut of 0.16, 0.24, and 0.32 in.

20-95. Torpedo Propeller-Blade Surfacing. G. L. Brown. *Engineering*, v. 163, Jan. 24, 1947, p. 73-76.

Torpedo propellers, designed in Australia, required blades with a driving surface of helicoid form, with pitch increasing uniformly with the radius from the axis. A mechanism was designed to reduce the blade surfaces to the required form by grinding.

20-96. Profile Grinding Machine With Optical Control. *Engineering*, v. 163, Jan. 24, 1947, p. 80-82, 84.

Machine manufactured in Canada illustrated and described.

20-97. Good and Bad Structures in Machining Steel. Norman E. Woldman. *Materials & Methods*, v. 25, Feb. 1947, p. 80-86.

(Turn to page 38)

International Nickel Promotes French, Fraser and Others

Herbert J. French, past national president M, and H. J. Fraser M have been elected as vice-presidents of the International Nickel Co., New York. Mr. Fraser has been with the company since 1923, and has been an assistant vice-president since 1943.

Mr. French was also recently appointed an assistant vice-president of the International Nickel Co. of Canada, Ltd., the parent company. Since 1943 Mr. French has been assistant manager of the development and research division of International Nickel.

H. J. French

A biographical appreciation of Mr. French was published in the February 1943 issue of *Metal Progress*, at the time he was president of the A.S.M. He also received the society's Henry Marion Howe Medal in 1931 and was Campbell Memorial Lecturer in 1933. For 3½ years during World War II, he served with the War Production Board at Washington, D. C.

O. B. J. Fraser

As a consequence of Mr. French's appointment, several other changes have been made in the staff of International Nickel. O. B. J. Fraser M, for 13 years director of technical service on mill products and since 1945 also head of the industrial chemicals section of the development and research division, now succeeds Mr. French as assistant manager of the division.

William A. Mudge, chairman of the New York Chapter M, has been appointed director of the technical service section of the development and research division, and William F. Burchfield M assistant director. Donald J. Reese M, while continuing to head the iron and nonferrous casting section, will also be in charge of the division's field sections, a position formerly under the direction of Mr. French.

W. A. Mudge

Various units of the division's steel section are now headed by J. W. Sands M (engineering steels); V. N. Krivobok M (stainless steels); T. N. Armstrong, Jr. M (railway and cast steels).

Prizes Given for Best Questions at Forum

Reported by W. E. Borin
Metallurgist, Underwood Corp.

Hartford Chapter M enjoyed its annual forum meeting on Feb. 11 with a large audience present to hear and to ask questions of a panel of experts selected from the local membership.

The panel, which was totally unrehearsed, consisted of Ralph Hare, David J. O'Neil, Howard F. Barton, C. J. McDonall, H. J. Noble, William Mounce, George G. Wilcox, Horace W. Staples, and Leo T. Benoit. Interrogator was A. H. d'Arcambal whose able chairmanship and ready humor kept debate away from the premises.

Membership pins were given as prizes for the best questions offered and were won by Harold F. Sprague and Helen N. Demko. Mr. Sprague asked about heat treatment practice for die steels, and Miss Demko inquired into the field of nitriding. In addition, anyone who managed to "stump the experts" received a token for his effort.

Preceding the meeting, a dinner was held during which a coffee talk was presented by Atty. Thomas J. Dodd who related some of his experiences at the Neurnberg war criminal trials.

Welding Service Expanded

K. Wm. Ostrom M announces the establishment of new office and warehouse facilities for K. Wm. Ostrom and Co. Resistance Welding Service in Philadelphia. The company is an agent for National Electric Welding Machines Co. and distributor for P. R. Mallory and Co., and has expanded its line to cover complete resistance welding parts and repair service.

Ebonol Processes
for BLACKENING and COLORING
Enthone Ebonol processes for blackening and coloring metals met the severe requirements of war materials. They are now being used for finishing *civilian goods* by manufacturers of cameras, optical instruments, electrical apparatus, radios, appliances, vacuum cleaners, typewriters and business machines. They are among the many who prefer the Ebonol processes for their adhesion, durability, deep color and ease of application. Informative literature available on all processes. Samples finished on request.
EBONOL "C" (U. S. Patent No. 2,364,993). A process easily operated for blackening and coloring copper, brass, and other copper alloys. Cupric oxide finish: stable, adherent and protective. Operating temperature 210° to 218° F.
EBONOL "S". A simple, one-bath, easy-to-operate process for blackening iron and steel with a ferroferric oxide coating. Low operating temperature, 285-290° F.
EBONOL "Z". A blackening process for zinc and zinc alloys. Operated without expensive supervision. Coating is very stable and is an excellent base for organic finishing.
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Case histories of several steels showing why they were or were not of the right structure or condition for satisfactory machining.

20-98. Toolsteel Tubing. Edwin Laird Cady. *Materials & Methods*, v. 25, Feb. 1947, p. 87-89.

Many parts now machined from solid toolsteel could be made from toolsteel tubing, which is available in oil, air and water hardening grades. Wide range of sizes can be used for a variety of tools, dies and other parts.

20-99. Increasing the Life of Machine Tool Parts. E. W. Nelson. *Materials & Methods*, v. 25, Feb. 1947, p. 133.

How a cast iron guide-rest was tipped with cemented carbide to improve its wear resistance.

20-100. The Lathe Used as a Broaching Machine. Bernard E. Frank. *Materials & Methods*, v. 25, Feb. 1947, p. 135.

How a lathe can be adapted for broaching operations.

20-101. High-Precision Thread-Grinding Machine. *Engineering*, v. 163, Jan. 31, 1947, p. 104-105.

Details of construction and operation of machine for production of small screws which are manufactured by a British company.

20-102. Modern Centerless Grinding Practice. Part I. D. E. Lower. *Machine and Tool Blue Book*, v. 43, Feb. 1947, p. 135-144, 146, 148.

Advantages of the method and some of the jobs performed. Analyzes grinding of fuel injection plungers for bombers. Limits on this job were ± 0.000005 in.

20-103. West Coast Diesel Manufacturers Speed Output. Harvey S. Peters. *Western Machinery and Steel World*, v. 38, Feb. 1947, p. 94-97, 108, 123.

Machining data of the horizontal boring, drilling and milling machine. Photographs of different operations.

20-104. Tool Life and the Selection of Carbides. (Concluded.) Raymond O. Catland. *Western Machinery and Steel World*, v. 38, Feb. 1947, p. 109-112.

Force vs. cutting position; force vs. speed; force vs. rake angles; tool life vs. work position; effect of flywheel on the cutting forces.

20-105. Cutting-Off Small-Diameter Tubing. *Machinery (London)*, v. 70, Jan. 30, 1947, p. 140-141.

Satisfactory method for cutting-off tubing of ⅜-in. diameter and 1/16-in. bore.

20-106. Plunge Grinding. *Aircraft Production*, v. 9, Feb. 1947, p. 43-45.

Combination of profile turning and blending, which has been applied to the hub for a two-bladed airscrew. Dimensional details and wheel profile of an operating link of which the whole form is finished by plunge grinding.

20-107. How to Use Carbide Cutters for Milling Straight Carbon and Cast Steel. Part III. H. A. Frommelt. *Iron Age*, v. 159, Feb. 27, 1947, p. 47-52.

Milling of straight carbon steels, in the rolled or forged condition, and of cast steel. Advantages of employing a heavy chip load and a high K-factor. Underlying reasons for the use of a relatively small number of blades in the cutters. A method of setting the blades in place while the cutter is held in the machine.

20-108. Some Metallurgical Factors Which Affect Machinability With Special Reference to Intermittent Cutting. K. J. B. Wolfe. *Metal Treatment*, v. 13, Winter 1946-1947, p. 225-247.

Results of an investigation into metallurgical problems encountered in gear cutting, using microscopical, tensile, Meyer hardness, X-ray, magnetic and internal stress determinations. Temperature developed by the cutting edge and temperature of the chips removed. Machinability of hardened steels, particularly the more highly alloyed ones, is much improved by a second tempering at about 25° C. lower than the first.

20-109. Save Minutes, Make More Profit Jig Boring. Frank Zagar. *American Machinist*, v. 91, Feb. 27, 1947, p. 78-80.

Production use of jig borers discloses the need for a simple hole-dimension chart. Value of tool sets for each job, collet attachments and better clamping.

20-110. Practical Ideas. *American Machinist*, v. 91, Feb. 27, 1947, p. 101-108.

Radius attachment and nose chuck refit old lathe. Telescoping support centers boring bars. Grinding large radii with small wheels. Drillrod tool and holder bores small holes. Threaded drill bushing eliminates changing jigs. Shaper tool extension cuts inside surfaces. Hints on small tools. How to machine large circular sectors. V-block simplifies thread pitch measurements. How to square fractions—discussion. Double-acting fixture speeds screw slotting. Crush-forming tool dresses surface grinder. Adjustable cone mandrel holds thin tubing.

20-111. Cutting Speeds With High Speed Steel Tools. *American Machinist*, v. 91, Feb. 27, 1947, p. 125.

Turning, drilling and tapping speeds and cutting fluids with various types of high speed steel tools.

20-112. Clamps for Jigs and Fixtures. (Continued.) W. H. Litten. *Machinery (London)*, v. 70, Feb. 6, 1947, p. 174-175.

Various clamping devices used for securing components in jigs, and workpieces or jigs to the tables of machine tools.

20-113. The DeVlieg No. 3B Jigmil. *Machinery (London)*, v. 70, Feb. 6, 1947, p. 177-181.

Combined jig boring and milling machine will handle a wide variety of work up to 2 tons in weight. Ample power and rigidity are provided to enable precision milling operations to be performed without impairing the accuracy of the machine for boring. Not only may jigs and fixtures be bored and milled conveniently at one setting of the work on the table, but small quantities of repetition parts can be expeditiously handled. Arrangement for automatic setting of the spindle head and table saddle to an accuracy of 0.0001 in.

20-114. Band Sawing Light Metals at High Velocities. H. J. Chamberland. *Modern Metals*, v. 3, Feb. 1947, p. 26-28.

Advantages of sawing, cutting and machining light metals.

20-115. Time-Saving Methods in Canadian National Shops. Howard Campbell. *Modern Machine Shop*, v. 19, March 1947, p. 124-130, 132.

A number of tools developed to save time and increase accuracy and efficiency.

20-116. Reducing Three Operations to One. Norman Iversen. *Modern Machine Shop*, v. 19, March 1947, p. 198, 200.

Through the use of broach inserts, a production part that formerly required three milling operations to finish is now finished in one operation. Workpiece is one of four pieces required in a toggle tool assembly used on assembly operations, all of which are finished in the same manner. Broaching operation is performed in a vertical surface broaching machine of 10 tons capacity, having a cutting stroke of 48 in.

20-117. Mass Production—of Chips. *Iron Age*, v. 159, Feb. 27, 1947, p. 46; *Modern Machine Shop*, v. 19, March 1947, p. 200, 205.

Parts are mine hoist drums, 20 ft. in diameter with a flange 21½ ft. in diameter. Specially designed pit lathe is used for work and machining. Machining consists of first roughing the flange sides and face and drum o.d., and then plunge cutting the grooves in the drum in which the 2½-in. wide mine hoist cable is to lie. Grooves are finish formed.

20-118. Ideas From Readers. *Modern Machine Shop*, v. 19, March 1947, p. 206, 208, 210, 212, 214.

A simple expanding fixture. Safety "kink" for monorail system. Facing tool for Van Stone flanges.

20-119. Thurst-Pound Loads Developed in Drilling Various Metals. *Modern Machine Shop*, v. 19, March 1947, p. 222.

Covers cast iron, machine steel, cast steel and carbon steel.

20-120. Latest Automatic Machine Methods Hold Tolerance to 30 Millionths of Inch. Joseph Geschelin. *Automotive and Aviation Industries*, v. 96, March 1, 1947, p. 18-21, 56.

Factors used in turning out fuel injectors at the ultramodern plant of G.M. Diesel Equipment Division, maintaining high level of quality in finish, tolerances and clearances of mating parts.

20-121. Piston Tooling Innovations. *Automotive and Aviation Industries*, v. 96, March 1, 1947, p. 34-35, 45.

Equipment and procedures at Zollner Machine Works are applicable to almost any type of piston and any volume of production.

20-122. Elimination of Vibration in Machine Tools. R. C. Griffith. *Industrial Diamond Review*, v. 7, Feb. 1947, p. 33-34.

General methods, and a few examples of actual problems and their solution. (Presented at Machine Tool Forum, Westinghouse Electric Corp., April 1946.)

20-123. Giant Gear Generator Cuts Rolling Mill Pinions. *Iron Age*, v. 159, March 6, 1947, p. 71.

Some details of planer-type generator designed specifically for use in cutting continuous herringbone gears up to 20-ft. diameter and 66-in. face width; cutters are oil hydraulic operated by the two cylinders set at 120° included angle. Cutter block guides are fixed and 30° single helical or 30° continuous herringbone gears can be cut. Operation of the cutter drive is by means of a variable stroke hydraulic pump located in the main pump tank and driven by a 50-hp. motor.

20-124. How to Use Carbide Cutters for Milling. H. A. Frommelt. *Iron Age*, v. 159, March 6, 1947, p. 74-78.

Various factors governing the choice of milling speeds and feeds for heat treated steels, together with some consideration of chip formation, cutter life and surface finish. The necessity for insuring rigidity in both workpiece and cutter; practical examples from actual shop experience.

20-125. One Setup for Roughing, Finishing and Counterboring. A. W. Ehlers. *Tool & Die Journal*, v. 12, March 1947, p. 69-71.

Experiments on cast iron parts. Roughing and finishing boring bars with the tool pattern and the pilot steps for the counterboring tools. Tool life of the counterboring tools was not as long as the regular roughing or finishing tools. Single setup of roughing, finishing and counterboring may be extended in scope and utility if solid carbide boring bars could be designed.

20-126. A Tooling Program for Forged Globe Valves. Part V. Carl F. Benner. *Tool & Die Journal*, v. 12, March 1947, p. 79-84, 136, 138.

The other components which make up a complete Parker offset globe valve assembly in addition to the forged brass valve body. Cross-sectional view of the valve with the individual parts grouped around it. The machining operations, and tools and machines used. (To be continued.)

20-127. How to Machine Aluminum and Magnesium With Carbide Tools. Carroll Edgar. *Tool & Die Journal*, v. 12, March 1947, p. 86-87, 90.

General machine considerations; feeds and speeds; tools; coolants.

(Turn to page 40)

Talking It Over After the Meeting

National President Boegehold (Center, Facing the Camera) and A. H. Karpicke (Right), Chairman of the Saginaw Valley Chapter, in an Informal Discussion With Another Member After the Meeting

Reported by V. E. Hense
Metallurgist, Buick Motor Division

Alfred L. Boegehold, head of the department of metallurgy, research laboratories division, General Motors Corp., and national president ⓐ, addressed the Saginaw Valley Group on "Correlation of Recent Data on Hardenability of Steel," on Feb. 18.

The paper covered the story behind the new hardenability bands on alloy steels that were agreed upon by an S.A.E. and A.I.S.I. joint committee. Mr. Boegehold enumerated the advantages of the H-band steels and had many interesting slides showing factors that affect the standard Jominy bar and showing comparison of actual cross-section hardness curves with predicted curves from Jominy data. The comparisons indicated that predicted cross-section hardness is adequate for general use.

Shows How Alloys Affect Steel Properties

Reported by A. J. Phillips
Caterpillar Tractor Co.

M. A. Grossmann, former national president ⓐ and director of research, Carnegie-Illinois Steel Corp., was the speaker at the February meeting of the Peoria Chapter. In his lecture, the title of which was "The Effect of Alloying Elements on Steel", Dr. Grossmann considered the more important properties of steel and outlined the effect which the common alloying elements have on these properties. Dr. Grossmann emphasized that very little is known about the mechanism by which these effects are produced.

A coffee talk on the art of bull fighting was given by John Harding, contact metallurgist for the Carnegie-Illinois Steel Corp. Mr. Harding illustrated his talk with a colored movie he took on a recent trip to Mexico.

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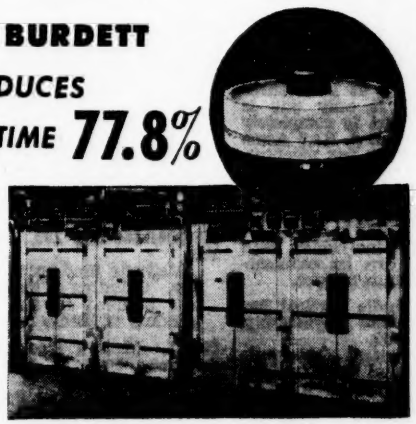

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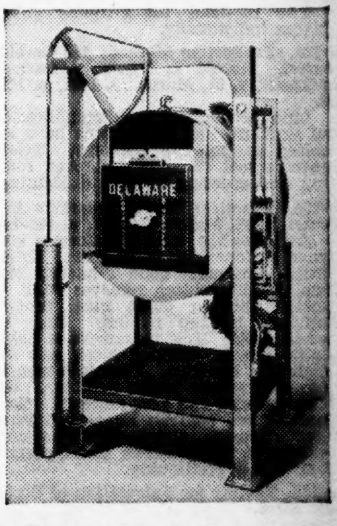

Descriptive literature sent on request

DELAWARE TOOL STEEL CORP.
Wilmington 99, Delaware

20-128. How to Use Carbide Cutters for Milling. Part V. H. A. Frommelt. *Iron Age*, v. 159, March 13, 1947, p. 52-56.

Milling of alloy steels with carbide cutters is discussed with particular reference to those materials usually considered difficult to machine, including armor plate, heat treated S.A.E. 4340, S.A.E. X1020, stress-proof steel and die plates. Examples are taken from actual shop practice. Feeds, speeds and cutter angles and the reason for their selection.

20-129. Semi-Automatic Operation Obtained by Push-Button Control. Stuart G. Leonard. *Electrical Manufacturing*, v. 39, March 1947, p. 110-112, 114.

The complete integration of electrical, mechanical, pneumatic, and hydraulic functions in a small precision gear shaper, with all the controls built in.

20-130. Thread Position Gages. *Machinery (London)*, v. 70, Feb. 13, 1947, p. 195-197.

Methods of manufacture concern screw-ring gages incorporating positional features having reference to the start of the thread. Function of gages is to control the machining of pairs of screwed parts in such a way that features of mating components assume their correct angular relationship when the parts are screwed home.

20-131. The Mechanism of Tool Vibration in the Cutting of Steel. *Machinery (London)*, v. 70, Feb. 13, 1947, p. 204-208.

Numerous influences to which a tool is subjected during cutting, the means by which energy may be absorbed or dissipated, and the way in which these factors are modified by vibration. (Abstract of a report of the Institution of Mechanical Engineers Subcommittee on Carbide Tools, prepared by Prof. R. N. Arnold.)

20-132. Air Fixtures Speed Hollow Milling. Kenneth F. Brooks. *American Machinist*, v. 91, March 13, 1947, p. 106-107.

How washing-machine wringer eccentric has ends finished on drill-press at 200 finished pieces per hr. Pneumatic fixtures avoid difficult lathe-chucking operation.

20-133. Devised—a Better Method for Sharpening Carbide Face Mills. G. W. Sharp. *American Machinist*, v. 91, March 13, 1947, p. 108-110.

Two methods for grinding cutter blades individually.

20-134. Production Methods Aid Carbide Control. Harold L. Flynn. *American Machinist*, v. 91, March 13, 1947, p. 125-128.

Line production and simplification of standard tool requisitions have resulted in long-run economy, efficient carbide tool grinding, improved routing and ordering at Jack & Heintz.

20-135. Practical Ideas. *American Machinist*, v. 91, March 13, 1947, p. 141-148.

Adjustable auto-transformer and knee switches for small tools. Cylindrical pins make good T-heads. Fly-tool milling cutter removes sand or scale. Circular guide races provide uniform lapping motion. Hints on small tools. How to remove a heavy lathe chuck. Graded block sets aid clamping buildups. Faceplate mounted unit grinds inside castings. Use the bandsaw and save material. Connecting rod controls large-radii turning. Tension chuck improves coil-winder rigidity. Rosan insert permits 360° elbow positioning.

20-136. Tooling for Fabrication of Stainless Steel. John C. Whitesell. *Steel Processing*, v. 33, Feb. 1947, p. 85-89, 112; *Tool Engineer*, v. 18, March 1947, p. 18-22.

Various tools employed by Red Lion plant of the Budd Co.

20-137. High-Production Broaching of Automobile Connecting Rods. *Machinery*, v. 53, March 1947, p. 160.

Crankshaft ends and caps of automotive connecting rods are completely machined at the rate of 150 pieces per hr. on the dual-ram broaching machine. Three separate broaching operations and one slitting operation are combined on 15-ton, 66-in. stroke machine.

20-138. What Happens in Using Steel Disintegrators? H. V. Harding. *Machinery*, v. 53, March 1947, p. 161-164.

The development of steel disintegrators, the theory of their operation, applications, and savings effected by their use. Eliminates the scraping of work in which broken tools are embedded. Details of one type of disintegrator.

20-139. A Nonreversible Rack and Pinion Motion. L. Kasper. *Machinery*, v. 53, March 1947, p. 175-176.

Movement of the rack can be obtained only by rotation of the pinion, and the mechanism is locked to prevent movement of the rack against the pinion.

20-140. Tool Engineering Ideas. *Machinery*, v. 53, March 1947, p. 177-179.

Adjustable boring fixture for machining fillets to different radii by Joseph G. Goulette. Automatic hydraulic knurling fixtures by C. T. Packer. Gage for measuring taper per inch by H. Moore.

20-141. Photographic Studies Contribute to Better Machining Methods. Norman Zlatin. *Steel*, v. 120, March 17, 1947, p. 94-97, 131-132.

Mechanism of metal cutting, captured by the camera's eye, provides documentary evidence of need for changes in metal structure, tooling, and even in machine tools themselves. "Stopped" action techniques are practical and yield much information that can be gained in no other manner.

20-142. Production Processes. Part XXI. Roger W. Bolz. *Machine Design*, v. 19, March 1947, p. 123-131.

General considerations for production milling.

20-143. Square Milling on the Automatic Screw Machine. *Screw Machine Engineering*, v. 8, March 1947, p. 39, 42-44.

Typical example of a part which could be processed by at least three different methods, yet only one is truly economical. Part is completely finished in 12 sec. on a $\frac{3}{8}$ RA 6 Acme Gridley multiple-spindle bar machine.

20-144. Thread Rolling on the Brown & Sharpe Automatic Screw Machine. *Screw Machine Engineering*, v. 8, March 1947, p. 45-47.

Features a versatile tool which, with proper application, can be economically used for thousands of jobs.

20-145. Cone Four-Spindle Vertical Bar Machine. *Screw Machine Engineering*, v. 8, March 1947, p. 56-60.

Design of the vertical Conomatic provides four horizontal work spindles in a vertical row or plane with all work spindles held in one stationary spindle cabinet. Bar stock is presented to quadruplicate tools held in each of the machine's two cross slides and one end working slide; thus four pieces are produced simultaneously. Construction details.

20-146. How to Use Carbide Cutters for Milling Stainless Steels. Part VI. H. A. Frommelt. *Iron Age*, v. 159, March 20, 1947, p. 56-59.

Recommendations for the most suitable blade angles for Type 304 on the one hand, and all other types on the other hand, are made on the basis of a detailed research program in which many hundreds of experimental cuts were made under carefully controlled conditions.

20-147. Tooling Standard Machines for High-Speed Production. R. A. La Combe. *Production Engineering & Management*, v. 19, March 1947, p. 53-56.

Volume output of precision parts for new automatic washing machine is reached in record time with specially tooled standard machines. From an initial production rate of 150 units per month, the schedule has been increased to well in excess of 500 units daily.

20-148. Increased Spindle Speeds Cut Operation Time on Light Metals. Carroll Edgar. *Production Engineering & Management*, v. 19, March 1947, v. 57-58.

Recommended speeds and feeds, suggested coolants, and tool-grinding data for machining magnesium and aluminum with carbides.

20-149. Skillful Tooling Increases Output on Quality-Controlled Operations. *Production Engineering & Management*, v. 19, March 1947, p. 68-74.

Special-purpose tooling, skillfully designed jigs and fixtures, and an effective use of productive floor space, which has enabled Sundstrand to reach a product output of approximately 2500 complete units per day with an anticipated production for this year of 600,000 fuel pump units.

20-150. Friction Sawing Lowers Cutting Cost. *Production Engineering & Management*, v. 19, March 1947, p. 82.

Improvement in friction sawing centers mostly around proper cooling of the blade; efficiency of friction sawing increases with the rim velocity for speeds up to about 20,000 ft. per min. and remains nearly constant for higher values. One blade can handle the entire day's production of a modern steel warehouse, cutting many varied structural shapes. Each blade is reused after redressing as often as 60 times before finally becoming too small for further service.

20-151. The Crib. *Production Engineering & Management*, v. 19, March 1947, p. 87.

Setup for quick loading by Seymour Marcus. Foot-control for drill by Theodore C. Meadow.

20-152. Machining Magnesium. *Machine and Tool Blue Book*, v. 43, March 1947, p. 135-140, 142, 144, 146, 148, 150.

Fundamentals of machining magnesium. Milling operations, drilling, turning, boring, sawing, planing, and shaping. The proper cutting tools to be used with the various machining operations.

20-153. How to Grind Carbide Tools. Part II. H. A. Frommelt. *Machine and Tool Blue Book*, v. 43, March 1947, p. 153-154, 156-158, 160, 162, 164, 166-168, 170.

Methods used to grind milling cutters. Grinding of blades with the cutters inserted in the body, and the grinding of blades separately.

20-154. Modern Centerless Grinding Practice. Part II. Machines Attachment and Blades. D. E. Lower. *Machine and Tool Blue Book*, v. 43, March 1947, p. 243-246, 248-250, 252, 254-256, 258, 260.

Types of machines used and methods of operation. Workholding, loading, and feeding attachments and blades (angles employed and thicknesses).

For additional annotations indexed in other sections, see:

5-20; **7**-68; **19**-64; **21**-33-34; **23**-59-60-61-63-75-81; **24**-88-89; **25**-33; **27**-52-53-55-57.

NEW ENGLAND CARBIDE TOOL CO., INC.
Manufacturers of Precision Carbide Products
Cambridge 39 **Massachusetts**

(Turn to page 42)

Compliments

To H. A. SCHWARTZ, director of research, National Malleable and Steel Castings Co., on his election to honorary membership in the Belgian Foundrymen's Society. The only other person to receive this award was the French metallurgist, ALBERT PORTEVIN.

To J. GARLAND on his election as a fellow of the British Institution of Metallurgists.

To RUSSELL J. ALLEN, metallurgical engineer, Worthington Pump & Machinery Corp., on receiving the American Foundrymen's Association's John A. Penton Medal for his "earnest and unceasing contributions toward the advancement of gray iron technology".

To RICHARD A. FLINN on award of the A.F.A.'s Peter L. Simpson Medal for his work during the past year in the field of chilled and white irons. Dr. Flinn is metallurgist with the American Brake Shoe Co.

To HARRY M. ST. JOHN, brass foundry and forge shop superintendent, Crane Co., on the award of the A.F.A.'s Wm. H. McFadden Medal for "outstanding work in the field of nonferrous castings research over a period of many years".

To HENRY M. WASHBURN, president of Plainville Casting Co. and 38th president of the A.F.A., on his selection to receive the Joseph S. Seaman Medal for "outstanding service to the association and valuable contributions to the gray iron castings industry".

To EDGAR H. DIX, JR., director of metallurgical research for the Aluminum Co. of America, on receipt of the Francis J. Clamer Medal of the Franklin Institute, for his "meritorious contribution to the development of high-strength corrosion resistant aluminum products".

Promoted by Ohio Brass

Richard W. Parsons has been recently named technical director of the Mansfield factory of the Ohio Brass Co.

R. W. Parsons

Mr. Parsons, a graduate in metallurgy from Ohio State University, has been in the Ohio Brass engineering department for 20 years. He was named assistant metallurgist in 1929, plant metallurgist in 1931, and chief metallurgical engineer in 1942. Mr. Parsons represents the Ohio Brass Co. on several committees of the American Society for Testing Materials.

Educational Series Is on Toolsteels

Reported by William W. Austin, Jr.
Metallurgist, Southern Research Institute

Recognizing education as one of the chief justifications for the existence of the American Society for Metals, the Birmingham District Chapter has adopted the plan of sponsoring each year an educational program designed to give free up-to-the-minute instruction on pertinent metallurgical topics.

Last year's educational program was built around the idea of providing information of value to returning veterans in the metal fabricating fields. Hence a course of seven sessions was arranged featuring lectures by men of national reputation, and covering recent developments in such subjects as heat treatment, metallurgical instrumentation, materials of construction, and foundry and steelmaking practices. This series was the first effort of this nature to be undertaken by the Birmingham District Chapter, and succeeded to the extent of 100 enrolled from 31 companies.

The second series, presented during January and February 1947, covered the topic "Toolsteels". C. H. Vaughan of the Allegheny Ludlum Steel Corp. conducted a series of three lectures, and these were in turn followed by the showing of two sound movies entitled "Heat Treating Hints" produced by Lindberg Engineering Co. Emphasis was kept on the practical aspects of toolsteel selection and heat treatment, and the presentation was made on a strictly nonadvertising basis.

Through the financial support afforded by ear-marking 60% of the chapter's sustaining membership dues for educational purposes, several valuable aids were included in the course. For example, the A.S.M. publication "Tool Steels" by Gill was used as a textbook and copies were offered at half the regular price. In addition, the series of lantern slides showing all the figures and illustrations in the textbook were borrowed from the A.S.M. national office and used in connection with the lectures.

For the success of this undertaking the chapter is indebted to its Educational Committee ably headed by Robert W. Sandelin, research metallurgist, Stockham Pipe Fittings Co.

Killed in Lab. Explosion

Hugh Livingstone, metallurgist in the nonferrous section of the Department of Mines and Resources Laboratories and a member of the Ottawa Valley Chapter, was fatally injured on Feb. 22 by an explosion in the laboratory. Mr. Livingstone came to Ottawa from Vancouver, B. C., a few years ago and was particularly active in research work on magnesium.

NEW SINGLE NICKEL SALTS
SMALL DEFINITE CRYSTALS

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BRANCHES IN PRINCIPAL CITIES

21 LUBRICATION and Friction; Bearings

21-21. Selecting Correct Lubricants for Steel Mill Equipment. A. E. Hickel. *Steel*, v. 120, Feb. 24, 1947, p. 106, 110, 114.

Exact percentage, types of soap, additives, etc., required to obtain correct lubricants for steel plant equipment such as pressure systems, roll necks, bearings, mill tables, reduction gears, and pinions. Differences between worked and unworked penetration value should not exceed 40 points.

21-22. Coolant Is Purified in McGill's Flotation System. Ned Bailey. *Machine and Tool Blue Book*, v. 43, Feb. 1947, p. 182-184, 186, 188, 190, 192, 198, 200.

Analysis of the flotation method used at the McGill Manufacturing Co. to keep coolants constantly clean. Dangers of dirty coolants and the need for overcoming it. Method used and the benefits accruing to the company.

21-23. Strontium Greases. H. J. Worth and L. W. McClennan. *Oil and Gas Journal*, v. 45, March 1, 1947, p. 74, 76-78.

Preparation, properties, and uses.

21-24. Composition Bearings. W. A. Rankin. *Iron and Steel Engineer*, v. 24, Feb. 1947, p. 81-82; discussion, p. 82-83.

In addition to their use as roll neck bearings, composition bearings are proving themselves in many other applications.

21-25. The Use of Cutting Fluids in Precision Production. Gilbert C. Close. *Modern Machine Shop*, v. 19, March 1947, p. 134-138, 140, 142, 144, 146, 148, 150, 152.

Primary factors in the selection of cutting fluids and the application of the fluids under varying conditions of tools and materials.

21-26. Friction and Lubrication. F. P. Bowden and D. Tabor. *Annual Reports on the Progress of Chemistry for 1945, Chemical Society, London*, p. 20-46.

A review. 231 ref.

21-27. Design and Lubrication of Bearings. R. Schultz. *Lubrication Engineering*, v. 3, Feb-March 1947, p. 7-9.

Design considerations for bearings in which the lubricant is supplied intermittently. Illustrated.

21-28. What Is a Lubricant? Henry E. Mahncke. *Lubrication Engineering*, v. 3, Feb-March 1947, p. 10-14.

Discusses some of the physical and chemical phenomena involved in the mechanism of lubrication. Existing ideas concerning viscosity and oiliness are reviewed and the need for more detailed knowledge of these properties is indicated.

21-29. Latest Developments in Engine Bearings. Part I. P. M. Heldt. *Automotive and Aviation Industries*, v. 96, March 1, 1947, p. 28-31, 58, 60.

Materials and types; copper-lead, aluminum, and silver; micro and grid bearings.

21-30. On the Action of Cutting Oils. G. P. Brewington. *Journal of Applied Physics*, v. 18, Feb. 1947, p. 260.

Pros and cons of present theories.

21-31. Bearings Keep the Wheels Turning. Arthur Q. Smith. *Industrial Gas*, v. 25, Feb. 1947, p. 11-14.

Operations at Timken Roller Bearing Co., Canton, Ohio.

21-32. The Rheology of Lubricants. R. B. Dow. *Journal of Colloid Science*, v. 2, Feb. 1947, p. 81-91.

Recent developments in theory and practice, including the silicone lubricants, the fluorocarbon compounds, oiliness additives, e.p. additives, oxidation inhibitors, and high-pressure effects in lubricants. 30 ref.

21-33. Low-Temperature Cooling in the Machining Process of Metals. G. Pahlitzsch. *Headquarters Air Materiel Command Translation F-TS-1065-RE*, Feb. 1947, 21 p.

A calorimetric analysis of the thermal stress occurring during the machining of metals and the effect of reduction of the lubricant temperature to near-freezing on the structural and mechanical properties of both tools and materials. (Translated from *V.D.I.-Zeitschrift*, v. 88, 1944.)

21-34. Physico-Chemical Investigation of the Cooling Properties of Liquids Used During Machining of Metals. N. A. Pieteneva and P. A. Rebinder. *Bulletin of the Academy of Sciences of U.S.S.R.*, Section of Technical Sciences, no. 12, 1946, p. 1823-1829. (In Russian.)

Effect of variations in the rate of flow of coolant (aqueous solution of sodium oleate) showed that the cooling action decreased rather abruptly when the rate was decreased below a certain critical value. A theoretical explanation of these results.

21-35. Geometrical and Metallurgical Changes in Steel Surfaces Under Conditions of Boundary Lubrication. B. W. Sakmann. *Journal of Applied Mechanics*, v. 14, March 1947, p. A43-A52.

Changes taking place in metal surfaces during running-in tests. The surfaces were lubricated during the tests, which simulated conditions encountered in industrial practice. In all tests the geometry of the surfaces was changed. Different tests for the identification of the nature of the transformation are discussed. Heat-conductivity calculations made it possible to estimate the temperature reached during running-in. A tentative explanation of the origin of the transformations is presented.

21-36. Sliding Friction Under Extreme Pressures. Part I. *Journal of Applied Mechanics*, v. 14, March 1947, p. A68-A70.

Extended discussion of paper by S. J. Dokos, published in June 1946 issue and author's reply. M. Eugene Merchant presents a mathematical analysis of static and kinetic friction based on Mr. Dokos' data.

For additional annotations indexed in other sections, see:
3-80; **25**-33; **27**-56.

22 WELDING Flame Cutting; Riveting

22-108. Welding of Manganese Castings in Special Trackwork, Collaborating With Committee 27—Maintenance-of-Way Work Equipment. *American Railway Engineering Association Bulletin*, v. 48, Feb. 1947, p. 586-589.

Results of investigation.

22-109. Flux-Injection Cutting Stainless Steels. G. E. Bellew. *Steel*, v. 120, Feb. 24, 1947, p. 80-82, 104.

The carbide precipitation phenomenon and its behavior. Precautions in cutting shapes, risers and heavy steel mill material.

22-110. Pressure Welding. E. R. Proctor. *Aircraft Production*, v. 9, Feb. 1947, p. 63-66.

Commercial process adapted to the production of aircraft undercarriage legs utilizing a specific pressure and heating the work until upsetting occurs. Degree of shortening is taken as the control factor. Structure of material remains unaltered between the seam and the parent metal.

22-111. Powder Cutting of High Alloys. D. H. Fleming, Jr. *Materials & Methods*, v. 25, Feb. 1947, p. 73-76.

Iron-rich powder is introduced into the oxygen stream of the cutting torch to make the flame pass through the refractory oxides in the alloys. Use of the process on stainless steel, cast iron, high-alloy steels, and certain nonferrous materials, and other applications.

22-112. Weldments. Edwin Laird Cady. *Materials & Methods*, v. 25, Feb. 1947, p. 101-116.

Welding terms; engineering suitability; planning and designing weldments; production factors and materials for weldments; and typical applications of weldments.

22-113. Weldability of Magnesium-Base Alloys. *Materials & Methods*, v. 25, Feb. 1947, p. 121.

Relative weldability of various alloys.

22-114. The Welding of High-Temperature, High-Pressure Steel Valves. Vincent T. Malcolm and Sidney Low. *Welding Journal*, v. 26, Feb. 1947, p. 101-110.

Research and experience at Chapman Valve Manufacturing Co. in designing and constructing a welded bonnet valve for high pressures and temperatures.

22-115. S-Curves Point the Way for Successful Welding of Any High-Carbon or Alloy Steel. Leo Berner. *Welding Journal*, v. 26, Feb. 1947, p. 110-113.

The use of S-curves in welding to avoid hardness by proper heat control of the part to be welded, thus reducing or eliminating the likelihood of weld-cracking. (Reprint from *Victor Weld.*)

22-116. Adams Lecture for 1946—New Frontiers in Welding. Wendell F. Hess. *Welding Journal*, v. 26, Feb. 1947, p. 114-120.

Arc weld cooling rates; cracking and residual stresses; aluminum and magnesium alloy spot welding; hardenable steels; spot welding of heavy gages of steel; arc welding of thin sheets and hardenable steels; new equipment and research trends. 25 ref.

22-117. Pressure-Welding Stainless Steel Rings. Arnold L. Rustay, Alan Crowell, Stephen M. Jablonski and Charles J. Burch. *Welding Journal*, v. 26, Feb. 1947, p. 129-137.

A progress report on the application of pressure welding to the production of stainless steel rings ranging in sizes up to 20 in. in diameter with cross sections ranging from 1½ to 4½ sq. in. The process proved successful, but careful evaluation is necessary to determine the most economical method for a specific job.

22-118. Resistance Welding for Porcelain-Enameled Ware. Ralph S. Florek. *Welding Journal*, v. 26, Feb. 1947, p. 137-140.

Factors involved are illustrated by several specific cases, for instance, spout attachment on tea kettle. Estimates of cost savings.

22-119. Flash Welding of Concentrated Areas up to 24 Sq.In. in S.A.E.1020, N.E.9440 and N.E.8620 Steels. D. Bruce Johnston. *Welding Journal*, v. 26, Feb. 1947, p. 65s-81s.

Details of an extensive investigation which resulted in basic data for design of a machine capable of flash welding 8-in. solid rounds, and an area of 76 sq. in. of more-distributed area. Tables, charts, photomicrographs.

22-120. Progress Report on the Flash Welding of High-Strength Aluminum Alloys. R. Della-Vedowa and E. A. Reynolds. *Welding Journal*, v. 26, Feb. 1947, p. 81s-87s.

Techniques developed for flash welding of 24S-T aluminum alloy tubing and bar stock. Joint efficiencies and joint strength consistencies were determined by static tension tests of welded specimens. Tests were also conducted to determine corrosion susceptibility of the weld area when unprotected and under a protective coating.

22-121. Discussion on "The Effect of Alloying Elements on the Tensile Properties of 25-20 Weld Metal". G. E. Lin-

(Turn to page 44)

New Techniques for Corrosion Protection Advance From Labs

Reported by J. A. Tinsman
Metallurgist
Gilbert & Barker Mfg. Co.

New deveopments in nucleonics, aircraft, and chemical industry, requiring high temperatures and high pressures, pose new problems to the corrosion engineer, F. R. Morral of American Cyanamid Co. told the Springfield Chapter ⊕ in a joint meeting with the American Electroplaters' Society.

To determine the extent of corrosion, new techniques, which a few years ago were laboratory curiosities, have been put to good use, he continued. Laboratories have determined qualitatively, and occasionally quantitatively, the corrosion of most metals and materials. Most industrial problems are complex and may require pilot plant or service tests.

Corrosion may be prevented by using certain pure metals, but these usually are too expensive and do not have the required physical properties. They are used, however, as coatings. Corrosion may be inhibited by using alloys as construction material or by using inhibitors in the corroding mediums. Counter electromotive forces have also proven a useful method of prevention.

Protective coatings may be grouped into four classes. Metal coatings are applied by hot dipping, electroplating, cladding, spraying, welding, spattering, and others. Diffusion coatings may be metallic or nonmetallic. Examples of chemical coatings are phosphate and other dip coatings, porcelain enamels, and anodizing. Organic coatings offer a variety of applications from oils to synthetic finishes.

Hot dip and electrogalvanized coatings were discussed in some detail, illustrating the four fundamental steps involved in all coating processes, namely, preparation of surface, activation, coating, and finishing.

A development that will permit country-wide standardization of electroplating results is demineralization of water, Mr. Morral said. He also pointed out the trend to use of multiple coatings for finishing. Whatever is done in the way of prevention should be worth while from an economic standpoint, and frequently it should help from the point of view of appearance and utility.

Burdett Doubles Production

Burdett Manufacturing Co. has joined the ranks of rapidly expanding midwestern manufacturers, moving to large new quarters at 3433 West Madison St., Chicago. Production capacity for gas heat equipment is doubled.

Methods of Using Salt Baths Explained

Reported by James W. Haupt
Cardwell Manufacturing Co., Inc.

George D. Johnston of the American Cyanamid Co., speaking on "The Application of Salt Baths to the Heat Treatment of Steel", discussed the chemical compositions of the salts and their method of use, their limitations and the precautions necessary to avoid accidents.

Mr. Johnston addressed the Wichita Chapter ⊕ on Feb. 13. He gave a general description of salt baths used in the heat treatment of steel, classifying them into three groups, namely, for low-temperature heating up to 1100° F., for medium-temperature up to 1650° F., and high-temperature up to 2400° F.

Carburizing salts Mr. Johnston also divided into three groups: *(a)* those suitable for light case carburizing; *(b)* medium case; and *(c)* deep case. Fumes from sodium cyanide, which is included in some of these salt baths, are not poisonous, contrary to general belief, he said.

Mr. Johnston then discussed austempering, martempering, and cycle annealing, and closed his lecture by showing slides of various furnace applications using salt baths.

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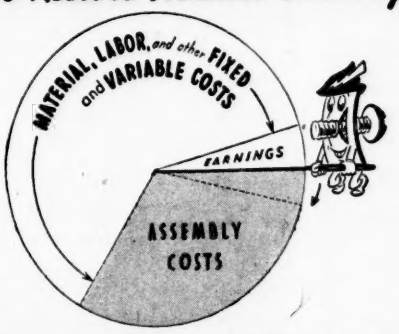

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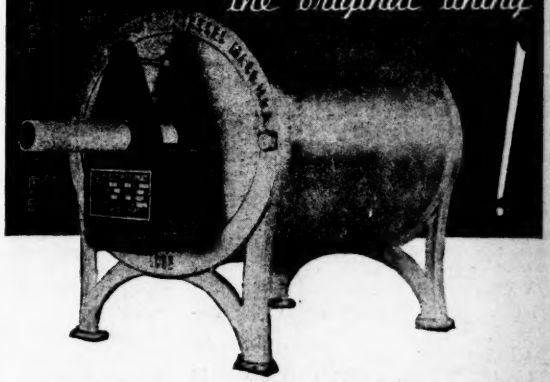

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The Sentry Company
FOXBORO, MASS., U. S. A.

nert and F. K. Bloom. *Welding Journal*, v. 26, Feb. 1947, p. 119s-120s.

Results presented in paper by Campbell and Thomas, Nov. 1946 issue, compared with results of a similar program carried out by the authors. In most cases, the agreement is very good.

22-122. Discussion of Paper "Additional Timing Period of New Motor-Driven Control Increases Gun Welder Speed". A. C. Johnson. *Welding Journal*, v. 26, Feb. 1947, p. 103s.

Although the control described in paper by H. I. Stanback, November 1946 issue, will operate at a rate of 400 cycles per min., nevertheless, this rate of speed results in poor and inconsistent welds.

22-123. Mechanical Properties and Microstructure of Open-Butt Oxy-Acetylene Compression Welds. H. H. Chiswik. *Welding Journal*, v. 26, Feb. 1947, p. 115s-119s.

Essential features of the open-butt oxy-acetylene compression welding process. The members to be welded are heated to the melting point using a multiflame oxy-acetylene burner inserted between the surfaces to be joined. When the faces reach the melting point, the burner is withdrawn and pressure is applied to make the joint. Mechanical properties and microstructural characteristics of welds made by the process.

22-124. How to Clean Welds. Thomas L. Adas. *Iron Age*, v. 159, Feb. 27, 1947, p. 44-46.

The effects of various kinds of foreign matter upon the quality of a welded joint, how the cleaning should be performed, and what tools should be employed.

22-125. Practical Applications of Blind Riveting. Milo Ketchum. *Iron Age*, v. 159, Feb. 27, 1947, p. 60-62.

A number of unusual uses for blind rivets, such as repairing loose roofing sheets, attaching door hinges to stainless steel refrigeration units and installing metal insulation retainer sheets in inaccessible locations.

22-126. Mechanical Properties of Flush-Riveted Joints Submitted by Five Airplane Manufacturers. Progress Summary No. I. William Charles Brueggeman. *National Advisory Committee for Aeronautics, Wartime Report W-79*, Feb. 1947, 7 p.

Charts, tables, and photomicrographs.

22-127. Soft Soldering as a Production Process. R. G. Harper. *Sheet Metal Industries*, v. 24, Feb. 1947, p. 345-354.

Soldering of components fabricated from sheet and strip, from the point of view of the efficient quantity-production of joints of consistently high quality with economy in labor and solder. Aspects of the soldering operation which directly influence the selection of solder. (Paper presented to the Sheet and Strip Metal Users' Technical Association, at the Winter Conference in London on Jan. 31, 1947.)

22-128. Methods of Studying the Behavior of Steel During Welding. H. Granjon. *Sheet Metal Industries*, v. 24, Feb. 1947, p. 385-391.

Experimental methods on plates 10 mm. thick.

22-129. Riveting and Spot Welding Magnesium Alloys. Allen G. Gray. *Steel*, v. 120, March 3, 1947, p. 114-115, 142, 144, 146, 148, 150, 152, 154.

Effective fastening procedures involving use of modern equipment and understanding of a few fundamental principles.

22-130. Induction Soldering Speeds Kitchen Utensil Production. L. Gise and J. R. Stewart. *Steel Processing*, v. 33, Feb. 1947, p. 101-102.

Application of induction soldering of stainless steel kitchen utensils resulted in an increased production rate, in a reduction of labor cost, and in an improvement of the quality of the product.

22-131. Cast Iron Weld Repair Methods. W. J. Pfander. *American Foundryman*, v. 11, Feb. 1947, p. 24-34.

Methods employed at Ford Motor for making weld repairs, and some of the problems encountered.

22-132. Metallic Joining of Light Alloys. *Light Metals*, v. 10, Jan. 1947, p. 20-32; Feb. 1947, p. 103-108.

The available methods of joining thin-gage light-alloy materials and the metallurgical aspects of the problem of soft soldering. The many and varied soft solders which have been suggested for aluminum. The lack of coordinated investigation and field test results is stressed. (To be continued.)

22-133. Submerged Melt Welding of Corrosion Resistant Metals. R. J. Anderson and H. J. Roberts. *Canadian Metals & Metallurgical Industries*, v. 10, Feb. 1947, p. 18-19, 29, 34.

Methods that have been developed in producing satisfactory welds in this class of materials. Welding of some heat resistant metals by the submerged melt welding process.

22-134. Characteristics of Welding Arcs on Aluminum in Atmospheres of Helium and Argon. (Concluded.) F. A. Wassell. *Aluminium and the Non-Ferrous Review*, v. 11, Oct-Dec. 1946, p. 88.

The most important features of these welding processes. The conclusions are based in experiments reported in the previous installment.

22-135. Joining Magnesium Alloys. Allen G. Gray. *Steel*, v. 120, March 10, 1947, p. 90-91, 114, 116, 119.

Gas, arc, and flash welding and soldering techniques. (To be continued.)

22-136. Crankshaft Repair and Assembly. S. Hunter Gordon. *Welding*, v. 15, Feb. 1947, p. 50-53.

An application for flash butt welding; details regarding assembly methods. (Extract from a paper for the Institute of Marine Engineers.)

22-137. Resistance Welding in Mass Production. A. J. Hipperson and T. Watson. *Welding*, v. 15, Feb. 1947, p. 61-69.

First principles and the effects of spot welding variables upon operation.

22-138. Welded Steel-Plate Axlebox. *Welding*, v. 15, Feb. 1947, p. 53.

Axlebox, fabricated from steel plates, which takes the R.C.H. standard bearing, liner and lubricating pad, is of simple all-welded construction and economical both in manufacture and maintenance. Lends itself to the use of simple jigs and flow production.

22-139. Oxygen Cutting. Part VIII. Manual and Machine Methods. E. Seymour Semper. *Welding*, v. 15, Feb. 1947, p. 73-78.

Electronically controlled cutting machines.

22-140. Weld Defects. Their Causes and Prevention. Frederick S. Dever. *Welding*, v. 15, Feb. 1947, p. 79-84.

Various defects likely to be encountered in arc, gas, spot, and atomic-hydrogen welding.

22-141. Welded Locomotive Boilers Are Here to Stay. *Welding Engineer*, v. 32, March 1947, p. 35-38.

Methods of fabrication, joint preparation, testing.

22-142. Nash Builds All-Welded Bodies. John H. Giroux. *Welding Engineer*, v. 32, March 1947, p. 39-41, 64.

Spot and arc welding operations.

22-143. The Hydrogen-Fluorine Torch. H. F. Priest and A. V. Grosse. *Welding Engineer*, v. 32, March 1947, p. 42-43.

Results obtained with the torch to date. Economic and transportation problems.

22-144. Welding Processes at Northrop Aircraft. Fred M. Burt. *Welding Engineer*, v. 32, March 1947, p. 44-49.

Inert-gas shielded-arc welding, flash-welding, and spot welding procedures.

22-145. Flame Cutting Plates for Welded Ships. Milton Forman. *Welding Engineer*, v. 32, March 1947, p. 53-56.

System developed at Ingalls Shipbuilding Corp. for plate edge preparation. Joint-type chart covers every condition found in the construction of decks, shells, and bulkheads for ships.

22-146. Welding Military Equipment in Britain. E. Dacre Lacy. *Welding Engineer*, v. 32, March 1947, p. 57-59.

A review covering fabrication of guns, carriages, the Bailey bridge, landing craft.

22-147. Industrial Motor Line Fabricated by Welding. Quentin Graham. *Welding Engineer*, v. 32, March 1947, p. 60-61.

Welding and flame cutting simplify production of Elliott "Fabri-Steel" electric motor line.

22-148. Uniform Welding Results. Malcolm Thomson. *Steel*, v. 120, March 17, 1947, p. 101-102.

Equalization in multiple spot welding and heating is achieved quite simply by separating secondary circuits, having one transformer wound with individual secondary coils, one for each welding circuit.

22-149. Clear the Track for Welding. Part I. H. S. Swan. *Industry and Welding*, v. 21, March 1947, p. 26-27, 54-56.

Welding is used as a primary method of manufacture on the smallest to the largest locomotives at American Locomotive plant, Schenectady, N. Y.

22-150. Why Not More Structural Welding? *Industry and Welding*, v. 21 March 1947, p. 29-31, 85.

Purpose, preconstruction provisions, permissible unit stresses and welding procedures of structural welding code.

22-151. Welding Sheet Metal to Tubing. Paul Newton. *Industry and Welding*, v. 21, March 1947, p. 32-33, 58.

Use of stampings and tubing plus a combination of resistance and arc welding.

22-152. How to Weld Stainless Steel With the Inert Arc. John B. Solter. *Industry and Welding*, v. 21, March 1947, p. 40-42.

How to weld stainless steel, emphasizing preparation of the work and technique.

22-153. Repair, Maintenance and Fabrication in the Plant Weldery—Sherwin Williams Company. *Industry and Welding*, v. 21, March 1947, p. 44-45, 80-83.

Various oxy-acetylene and arc-welding operations at Sherwin Williams Co.

22-154. Note on the Soldering of Beryllium. Borge Madsen. *Review of Scientific Instruments*, v. 18, Feb. 1947, p. 135.

A technique claimed to give superior results.

22-155. Automatic Resistance Welders Speed Railroad Car Construction. Arthur M. Unger. *Iron Age*, v. 159, March 20, 1947, p. 40-45.

Production of lightweight all-steel Pullman cars by the use of giant, highly automatic resistance welding machines. Units are capable of welding an entire car roof or two complete car sides at one time. One unit is capable of making more than 8000 spot welds in slightly more than 2 hr. to complete an entire car roof in one operation. Ingenious fixtures and photo-tube relay indexing systems used in these operations.

22-156. Uniform Values Increase Dependability of Resistance Welds. Part II. Frederick S. Dever. *Production Engineering & Management*, v. 19, March 1947, p. 59-62.

Inspection methods, weld specifications, and a description of equipment.

22-157. Hydrogen-Fluorine Torch. Homer F. Priest and Aristid V. Grosse. *Industrial and Engineering Chemistry*, v. 39, March 1947, p. 431-433.

(Turn to page 46)

Advantages of Argon-Shielded Arc Welding Over Helium Listed

Reported by F. G. Wayman
Chemist, Steel Co. of Canada, Ltd.

"Production Applications for Inert Gas-Shielded Arc Welding" was the subject of an address by R. J. Anderson, Dominion Oxygen Co., Limited, Toronto, Canada, before the members of the Montreal Chapter on Feb. 3.

Gas-shielded arc welding is the general term used to designate arc welding carried out under a blanket of argon or helium gas surrounding the arc, welding puddle, electrode, and material in the vicinity of the welds, Mr. Anderson explained. Magnesium, aluminum, stainless steel, nickel and nickel alloys, copper alloys, lead, silver, and stellite can be welded with this technique. It is also applicable to high-carbon and low-alloy steels.

Although experiments in helium-arc welding were first carried out about 20 years ago, it was not until World War II that the method was employed in d.c. welding of magnesium. Use of argon subsequently became more prevalent.

Argon-shielded arc welding has certain advantages over helium-shielded arc welding:

1. It is more versatile. Aluminum can be welded without any flux, whereas other methods require fluxes.

2. Less gas is required per weld. The density of argon is approximately the same as that of air and hence it tends to cling to the work. Helium, being very much lighter, tends to disperse into the surrounding air.

3. Argon is more readily available than helium. About 0.9% argon is present in the atmosphere and, therefore, any liquid oxygen plant is a potential source of argon although it can only be extracted with some difficulty. There is only one commercial source of helium in the world and its use is controlled by the U. S. Government.

With regard to power supply for gas-shielded arc welding, extensive experiments have indicated that a.c. high frequency can be employed on all materials; d.c. straight polarity can be used on everything but aluminum and magnesium.

Two color films, "Oxy-Acetyene Pressure Welding" and Scrubbing Steel With a Brush of Flames" were presented through the courtesy of Dominion Oxygen Co., Limited.

Tatnall Speaks on Design

Reported by Kenneth O. Uran
Columbian Enameling & Stamping Co.

Terre Haute Chapter ⬢ registered an enjoyable evening discussing with F. G. Tatnall the relationship between the engineer and the designer. Mr. Tatnall was able to illustrate through his extensive chalk talk many of the factors which designers either overlook or are unaware of in practice. It is not always necessary to increase the size of a particular piece that fails, he said. Often a minor change in design or fabrication will bring about the desired results without any increase in weight.

Apparently Mr. Tatnall's reputation as an entertainer as well as an engineer preceded him, for a near-record group turned out to hear his stimulating discussion.

Calumet Has Ladies' Night

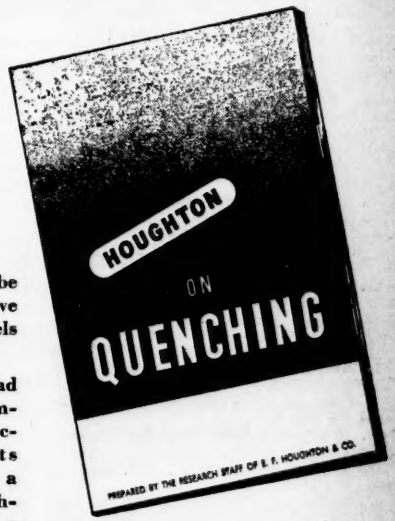
Reported by W. S. Lienhardt
General Superintendent, Metal & Thermit Corp.

Perhaps the largest number ever to attend a meeting of the Calumet Chapter ⬢ was recorded at the annual Ladies' Night on March 11. Speaker of the evening was J. D. Brown, a graduate engineer from Lehigh University and sales supervisor of the technical products division of the Corning Glass Works. Mr. Brown spoke on "Glass in the Home and Industry".

Mahoning Has President's Night

President's Night of the Mahoning Valley Chapter ⬢ Finds (Left to Right) Myron A. Hughes, Chapter Chairman; A. L. Boegehold, National President of the Society and Principal Speaker at the Meeting; H. J. Wiegel, a Past Chairman; and E. C. Smith, Chief Metallurgist, Republic Steel Corp.

Who else *could* have written it?



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A welding or cutting torch which uses a mixture of hydrogen and fluorine, and produces extremely high flame temperatures. Copper, nickel, monel, and steel were welded readily, but attempts to weld aluminum were unsuccessful. Copper was cut evenly, upon increasing the fluorine supply.

22-158. Oxy-Acetylene Pressure Welding as It Affects Design. R. A. Kubli. *Product Engineering*, v. 18, March 1947, p. 117-121.

Metals that can be pressure welded; details of joint construction and other design information; pressure, heat input and shortening, which are taken as the independent variables of the welding process. Time and temperature are treated as dependent variables.

22-159. Projection Welding of Low Carbon and Stainless Steel Sheet. Mario L. Ochieano. *Product Engineering*, v. 18, March 1947, p. 124-126.

Proper application of projection welding techniques. Details of projection locations and recommended sizes for different thicknesses of low carbon and stainless steel sheet. Allowable design strengths for projection welds.

For additional annotations indexed in other sections, see:
4-22; 8-33; 12-38-48; 19-71; 23-73-86; 24-72-85; 25-31; 27-61-65.

LATEST NEWS ON
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Progressive Welder Co. Detroit 12, Mich.

23 INDUSTRIAL USES and Applications

23-56. Kitchen and Bathroom Units for Prefabricated Houses. (Continued.) *Machinery (London)*, v. 70, Jan. 16, 1947, p. 73-75.

Processing and assembly at the Works of Sentinel Ltd.

23-57. Assembly Operations on Aluminum Houses. (Continued.) *Machinery (London)*, v. 70, Jan. 30, 1947, p. 131-138.

Equipment and operations involved in cleaning, dipping, stoving and assembly.

23-58. Die Castings in Industrial Design. H. K. Barton. *Machinery (London)*, v. 70, Jan. 30, 1947, p. 148-152.

Various applications of die castings; advantages.

23-59. Specialized Work in Pressure Fittings. Ralph G. Paul. *Western Machinery and Steel World*, v. 38, Feb. 1947, p. 82-85, 123.

Equipment and operations employed in manufacture of special fittings used in connection with the storage and handling of inflammable and explosive liquids.

23-60. Production Line of Water Heaters. Gordon B. Ashmead. *Western Machinery and Steel World*, v. 38, Feb. 1947, p. 90-93, 113-114.

Pictorial story of production of Rheem hot water heaters from raw stock to finished product.

23-61. Modern Methods Characterize Mass Production in Bendix Brake Plant. Joseph Geschelin. *Automotive and Aviation Industries*, v. 96, Feb. 15, 1947, p. 26-30, 74, 76.

Operations and equipment showing straight-line flow of operations, careful subdivision of individual operations, compact departmental layout, complete mechanization, and ingenious revolving-table-type final assembly stations.

23-62. Aluminum Versus Copper. Harold A. Knight. *Materials & Methods*, v. 25, Feb. 1947, p. 61-64.

Aluminum is now a strong contender for many electrical applications.

23-63. Percussive Rock Drilling With Tungsten Carbide Bits. W. W. Varvill. *Mine & Quarry Engineering*, v. 13, Feb. 1947, p. 37-44.

Development of sintered tungsten-cobalt carbide bits in Germany. The design of the bits and auxiliary equipment; production results from use in an iron mine.

23-64. The Role of Vanadium in Gray Iron Castings. Part II. R. G. McElwee and T. E. Barlow. *Vancoram Review*, v. 5, no. 2, p. 14-16.

Properties and application of vanadium cast iron alloys.

23-65. Magnesium Product Developments. L. M. Oldt. *Modern Metals*, v. 3, Feb. 1947, p. 16-17.

Products in the children's equipment field, outside home equipment, sports equipment, and household appliances. Reasons why manufacturers are introducing these new products in magnesium and advantages of the metal.

23-66. Magnesium Reel. *Modern Metals*, v. 3, Feb. 1947, p. 31.

Development of magnesium reel giving material, cost, weight, salvage and life expectancy comparisons with wood and steel.

23-67. Eyes Right. *Die Castings*, v. 5, March 1947, p. 22-24, 50-52.

Aluminum die castings provided exactness of dimension, light weight, strength, and rigidity at a cost far less than possible with any other method, in the Royal Rotoscope, an instrument for controlling and coordinating the muscles of the eye.

23-68. Light Alloys in the Textile Industry. *Light Metals*, v. 10, Jan. 1947, p. 33-53.

Theory and practice of applications of aluminum and magnesium in the cotton, woolen, synthetic fiber and associated industries.

23-69. Turbine Disks. *Iron and Steel*, v. 20, Feb. 1947, p. 63-64.

First steels used in Goblin turbine disks were austenitic but it has been found that pearlitic steel withstands variations in temperature better. Properties of the hub section of the disk must be kept under close control.

23-70. Steels for Mold Construction. John H. Burkam. *Industrial Plastics*, v. 2, March 1947, p. 26-27.

The properties of various alloy steels and their suitabilities for plastic mold construction.

23-71. How Metals Help the Angler. *Inco*, v. 21, Winter 1946-1947, p. 10-12.

Application of different nickel alloys to various pieces of fishing tackle.

23-72. Six Precious Platinum Metals Used to Save Money. *Inco*, v. 21, Winter 1946-1947, p. 12-14, 25.

Applications of platinum, palladium, rhodium, ruthenium, iridium, and osmium to industrial uses as well as to jewelry.

23-73. A New Development in Blind Riveting. *Inco*, v. 21, Winter 1946-1947, p. 14-16.

Ways in which blind monel rivets are used.

23-74. Life Stories Important in the Oil Fields. *Inco*, v. 21, Winter 1946-1947, p. 18-19.

Parts of new type of pump for handling sour crude oil are made of monel, except for the graphite-impregnated plastic packing rings.

23-75. Hydraulic Circuits and Applications. Ransom Tyler. *Tool & Die Journal*, v. 12, March 1947, p. 91, 94-95.

Miscellaneous applications of hydraulic systems for metal drawing and spinning equipment, centrifugal casting, machining controls, plastic molding. (To be continued.)

23-76. French Automobile Industry Reborn. *Light Metals*, v. 10, Jan. 1947, p. 3-14.

Growing application of light and ultra-light alloys in French motorcar and commercial vehicle construction. Some interesting contrasts are drawn between design tendencies in France and U.S.A. (From "Salon de l'Automobile" by Maurice Victor, *Revue de l'Aluminium*, v. 23, 1946, p. 321.)

23-77. Aluminum and the Rubber Industry. *Light Metals*, v. 10, Feb. 1947, p. 57-68.

The benefits afforded by aluminum in the production and processing of rubber; applications where the metal possesses established superiority over alternative materials.

23-78. Air Transport and Light Metal. Hedley S. Crabtree. *Light Metals*, v. 10, Feb. 1947, p. 78-86.

Trends and future possibilities of transport aircraft in the light of structural evolution toward more economical production and operation. The part to be played by aluminum and magnesium, and the attitudes which should be adopted by the industries concerned with these metals.

23-79. Printing Industry and Light Alloys. *Light Metals*, v. 10, Feb. 1947, p. 86-96.

Current applications of aluminum alloys in printing plant and equipment, and in printing processes. Theory and practice of the use of magnesum in photo-engraving.

23-80. Cut Operating Cost—and Increase Payload. *Light Metals*, v. 10, Feb. 1947, p. 97-102.

An elementary mathematical analysis of the advantages of light-metal construction for the bodywork of commercial vehicles. (From *Revue de l'Aluminium*, v. 23, 1946, p. 315.)

23-81. Hard Alloys Go Underground. Sheldon P. Wimpfen. *Mining and Metallurgy*, v. 28, March 1947, p. 148-149.

Tungsten carbide insert bits, a revolutionary development in rock drilling.

23-82. Developments in the Application of Aluminum Alloys. E. D. Iliff. *Metallurgia*, v. 35, Feb. 1947, p. 197-201.

Why bigger demands are being made for various forms of wrought aluminum; some of the industrial fields in which aluminum is proving a satisfactory material from an economic as well as a utilitarian point of view.

23-83. Alnico Materials for Small Motor and Generator Fields. F. W. Merrill. *Electrical Manufacturing*, v. 39, March 1947, p. 78-83, 180, 182, 184, 186, 188, 190.

Applications of the Alnicos in variable air-gap apparatus.

23-84. Magnesium, the Metal of Tomorrow. T. R. B. Watson. *Canadian Chemistry and Process Industries*, v. 31, Feb. 1947, p. 116-121.

Properties and applications of the metal and its alloys in light weight construction, thermal diffusivity, and cathodic protection.

23-85. Selenium Rectifiers. Julian Lobenstein. *Machine Design*, v. 19, March 1947, p. 112-114.

Increased-size plates capable of sustaining much higher voltage make them more useful as dry-plate rectifiers for applications such as those found in counting and grading equipment, electrocleaning units, electroplating and other electrochemical apparatus. General characteristics of various types of rectifying equipment.

23-86. Construction of Welded Freight Cars. R. L. Rex. *Railway Mechanical Engineer* v. 121, March 1947, p. 132-136.

Methods used by the Milwaukee Road in the mass production of all-welded gondolas. Use of low-alloy high-strength steels.

23-87. Plants Tell Why They're Swinging to New Materials. *Modern Industry*, v. 13, March 15, 1947, p. 49-54, 56.

Sweeping changes in materials for products and plant equipment. What and why material was chosen and what it replaced.

(Turn to page 48)

Foundry Suppliers

Products Described on Page 9

Air Reduction Sales Co. (R-390)
40 East 42nd St.
New York 17, N. Y.

Ajax Electric Co. (R-435)
Frankford Ave. at Delaware
Philadelphia 23, Pa.

Allis-Chalmers Mfg. Co.
(R-403, R-409, R-410)
Milwaukee 1, Wis.

Automatic Temperature Control Co.
34 East Logan St. (R-418)
Philadelphia 44, Pa.

Beardsley & Piper Co. (R-416, R-423)
2540 N. Keeler Ave.
Chicago 39, Ill.

Brickseal Refractory Co. (R-398)
158 Fourteenth St.
Hoboken, N. J.

Centrifugal Casting Machine Co.
P. O. Box 947, Tulsa, Okla. (R-401)

Chromium Mining & Smelting Corp., Ltd. (R-387)
Sault Ste. Marie, Ont., Canada

Demmler & Bros. Co., Wm. (R-412)
Kewanee, Ill.

Detroit Gray Iron Foundry Co.
282 Iron St. (R-383)
Detroit 7, Mich.

Dietert Co., Harry W. (R-419, R-420)
9330 Roselawn Ave.
Detroit 4, Mich.

Dreisbach Engineering Corp. (R-433)
85 Warburton Ave.
Yonkers 2, N. Y.

Dust Filter Co. (R-431)
1753 West Lake St.
Chicago 12, Ill.

Ecco High Frequency Co. (R-404)
7020 Hudson Blvd.
North Bergen, N. J.

Electric Furnace Co. (R-436)
Salem, Ohio

Ermac Co. (R-400)
1426 S. Santa Fe Ave.
Los Angeles 21, Calif.

Herman Pneumatic Machine Co.
Union Bank Bldg. (R-402)
Pittsburgh 22, Pa.

Hermann & Associates, C. C. (R-429)
5731 Somerset Dr.
Detroit 24, Mich.

Howard Foundry Co. (R-381)
1700 North Kostner Ave.
Chicago 39, Ill.

Johnston & Jennings Co. (R-422)
877 Addison Rd.
Cleveland 14, Ohio

Kerr Mfg. Co. (R-405)
6081 12th St.
Detroit 6, Mich.

Kindt-Collins Co. (R-426, R-427)
12651 Elmwood Ave.
Cleveland 11, Ohio

Laclede-Christy Clay Products Co.
Ambassador Bldg. (R-397)
St. Louis 1, Mo.

Meehanite Metal Corp. (R-384)
New Rochelle, N. Y.

Metro-Nite Co. (R-415)
3523 W. Silverspring Dr.
Milwaukee, Wis.

National Smelting Co. (R-388)
6700 Grant Ave.
Cleveland 5, Ohio

Newaygo Engineering Co. (R-411)
Newaygo, Mich.

Newcomb-Detroit Co. (R-428)
5741 Russell St.
Detroit 11, Mich.

Niagara Falls Smelting & Refining
Div., Continental-United Industries
2204 Elmwood Ave. (R-382)
Buffalo, N. Y.

Obermayer Co., S. (R-395)
2563 W. 18th St.
Chicago 8, Ill.

Pittsburgh Lectromelt Furnace Corp.
Foot of 82nd St. (R-393)
Pittsburgh, Pa.

Pittsburgh Metals Purifying Corp.
1352 Marvista St. (R-386)
Pittsburgh 12, Pa.

Redford Iron & Equipment Co.
21315 W. McNicholls Rd. (R-413)
Detroit 19, Mich.

Rhamstine Co., J. Thos. (R-421)
Box 289
Harlingen, Texas

Royer Foundry & Machine Co.
Kingston, Pa. (R-408)

Saunders & Co., Alexander
(R-391, R-392, R-406)
95 Bedford St.
New York 14, N. Y.

Schneible Co., Claude B. (R-432)
2827 25th St.
Detroit 16, Mich.

Trethaway Associates (R-424)
37 Wall St.
New York, N. Y.

Unexcelled Chemical Corp. (R-385)
2 Erie St., Cambridge, Mass.

Whiting Corp. (R-396)
Harvey, Ill.

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New York Office: 21 West Street, New York 6 · Offices & Warehouses in All Principal Cities
Canada: B. W. Deane & Company Limited, 751 Victoria Square, Montreal 1

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Standard steel wire gages between 0.025 and 0.394-in.; music wire gages

(Turn to page 50)

NATIONAL MEETINGS
for May

May 5-11—Society of the Plastics Industry. National Plastics Exposition, The Coliseum, Chicago. (Wesley S. Thurston, director of public relations, 330 West 42nd St., New York.)

May 15-17—Society for Experimental Stress Analysis. Annual Meeting and Symposium on Shock and Impact, Stevens Hotel, Chicago. (W. M. Murray, secretary-treasurer, S.E.S.A., P.O. Box 168, Cambridge 39, Mass.)

May 21-22—American Iron and Steel Institute. Technical and General Meeting, New York. (The Institute, 350 Fifth Ave., New York 1, N. Y.)

May 21-24—American Society of Mechanical Engineers. Oil and Gas Power 19th National Conference, Cleveland. (Ernest Hartford, executive assistant secretary, A.S.M.E., 29 West 39th St., New York 18, N. Y.)

May 22-31—Mid-America Exposition, Public Auditorium, Cleveland. (John A. Crawford, managing director.)

May 23-24—Electrochemical Society. Annual Spring Symposium of the Pittsburgh Section; Mellon Institute for Industrial Research, Pittsburgh. (G. B. Hatch, % Hall Laboratories, Hagan Bldg., Pittsburgh.)

May 23-24—American Institute of Mining and Metallurgical Engineers, Institute of Metals Division. First Annual Regional Conference on Technology of Metals, Hotel Sheraton, Boston. (H. I. Dixon, chairman of Regional Conference Committee, % Sterling Alloys, Inc., Woburn, Boston, Mass.)

May 27—Metal Powder Association. Third Annual Spring Meeting, Waldorf-Astoria Hotel, New York. (The Association, 420 Lexington Ave., New York 17, N. Y.)

Elongation & Impact Data Given for Six Weld Rods

Reported by R. E. Christin

Chief Metallurgist, Columbus Bolt Works

Before a joint meeting of the Columbus Chapters of A.S.M. and A.W.S. on Feb. 11, Louis J. Larson, welding engineer, Allis-Chalmers Manufacturing Co., Milwaukee, reported results of tests on metallic arc welds. The illustrated talk included data on elongations, impact values and ratings of welds made with A.W.S. 6010, 6011, 6012, 6013, 6020 and 6030 electrodes.

The 6012 and 6013 electrodes produce weld metal with lower ductility and impact values than the high quality rods, and stress relieving produces practically no improvement in these properties when the 6012 electrode is used. For the six types tested, elongation ranges from 15 to 24% in 2 in. as welded and from 17 to 30% when stress relieved. Impact value ranges from 21 to 31 ft-lb. as welded and from 17 to 35 when stress relieved.

The advantages of each grade of rod, benefits of coatings and effects of cooling time before quenching in boiling water were covered in discussion.

CHAPTER MEETING CALENDAR

CHAPTER	DATE	PLACE	SPEAKER	SUBJECT
Baltimore	May 19	Engineers' Club		Nucleonics and the Future of Metallurgy
Birmingham District	May 6		J. R. Ewing	Metal Cleaning
Boston	May 2	Hotel Sheraton		Young Men's Night
Buffalo	May 8	MacDoel's		Annual Meeting
Calumet	May 13	Phil Smidt and Son, Whiting, Ind.	J. D. Eisaman	Electric Furnace Practice
Cedar Rapids	May 7	Hotel Roosevelt	Hans Ernst	Metal Cutting Research
Chicago	May 8	Chicago Bar Association	M. A. Grossmann	Science
Cincinnati	May 9	Clovernook Country Club		Annual Election and Outing
Cleveland	May 5	Cleveland Club	Howard C. Cross	High-Temperature Alloys
Dayton	May 14	Engineers' Club	O. J. Horger	Metallurgy and Design
Des Moines	May 13	Des Moines Technical School		Plastics
Detroit	May 12	Rackham Building	C. L. Stevens	Metallurgical Process Control
Eastern New York	May 13	Circle Inn, Lathams	Zay Jeffries	
Fort Wayne	May 12	Chamber of Commerce		Annual Meeting
Georgia	May 5			
Hartford	May 9	Hotel Bond, Hartford		New England Regional Meeting
Kansas City	May 21	Pine Room		Annual Meeting
Los Alamos	May			Annual Picnic
Mahoning Valley	May 13		B. W. Gonser	Unusual Metals and Their Growing Importance
Milwaukee	May 20	City Club of Milwaukee		Annual Party
Montreal	May 5	Queen's Hotel	A. L. Boegehold	Correlation of Recent Data on Hardenability
Muncie	May 8	The Candle Lite	Hans Ernst	Machinability
New Haven	May 9	Hotel Bond, Hartford		New England Regional Meeting
New Haven	May 15	Hotel Taft	W. A. Purtell	
New Jersey	May 19	Essex House, Newark	Fred P. Peters	The New Science of Metals
New York	May 5	Building Trades Bldg.	Morris Cohen	Tempering of Toolsteels
Northwestern Pennsylvania	May 22	Erie, Pa.	H. W. McQuaid	Inherent Stresses in Steel
Notre Dame	May 14	Engineering Auditorium, Univ. of Notre Dame	C. L. Clark	Application of Steels to High-Temperature Service
Ontario	May 2	St. Catharines, Ont.	John Chipman	New Developments in Metals
Ottawa Valley	May 6	Chateau Laurier	A. L. Boegehold	Correlation of Recent Data on Hardenability
Penn State	May 5	Mineral Industries Bldg.	J. H. Hollomon	
Philadelphia	May 23	Essex House, Newark, N. J.		Tri-State Regional Meeting
Pittsburgh	May 8	Mellon Institute	J. H. Meier	Performance Tests on Large Machinery by Means of Strain Gages
Puget Sound	May 21	Wash. Athletic Club	Joseph Daniels	Sustaining Metals
Rhode Island	May 8		A. L. Boegehold	Correlation of Recent Data on Hardenability
Rochester	May 12	Powers Hotel		Annual Meeting
Rocky Mtn.				
Pueblo	May 8	Whitman Hotel	Howard Stagg	Toolsteels
Denver	May 9	Oxford Hotel	Howard Stagg	Toolsteels
Saginaw	May 20	Fischer's Hotel, Frankenmuth, Mich.	W. Stout	Engineering and Human Problems
San Diego	May 13	San Diego Hotel	D. L. Fox	Under-Water Corrosion
Southern Tier	May 12	Hotel Frederick, Endicott, N. Y.		
Springfield	May 19	Sheraton Hotel	R. H. Thielman	Application of Metals to Jet Propulsion and Gas Turbines
St. Louis	May 16		C. T. Evans, Jr.	Heat Resisting Alloys for Gas Turbines
Syracuse	May 10	Paul Dawson's Hotel, Liverpool, N. Y.		Annual Meeting
Terre Haute	May 12	Indiana State Student Union Bldg.		Magnesium From the Sea and Working of Magnesium
Toledo	May 28		R. J. Cowan	Gases in Metals
Tri-City	May 5		Frank Ross	Lubrication
Tulsa	May 13		H. W. McQuaid	What the Engineer Should Know About Metallurgy and Why
Washington	May 12		A. L. Boegehold	Correlation of Recent Data on Hardenability
West Michigan	May 19	Rowe Hotel	H. W. McQuaid	Metallurgical Factors in Processing Steel
York	May 14	Gettysburg	H. B. North	Tungsten—The Ore, Its Metallurgy and Its Compounds

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Standard steel wire gages between 0.025 and 0.394-in.; music wire gages

(Turn to page 50)

NATIONAL MEETINGS
for May

May 5-11—Society of the Plastics Industry. National Plastics Exposition, The Coliseum, Chicago. (Wesley S. Thurston, director of public relations, 330 West 42nd St., New York.)

May 15-17—Society for Experimental Stress Analysis. Annual Meeting and Symposium on Shock and Impact, Stevens Hotel, Chicago. (W. M. Murray, secretary-treasurer, S.E.S.A., P.O. Box 168, Cambridge 39, Mass.)

May 21-22—American Iron and Steel Institute. Technical and General Meeting, New York. (The Institute, 350 Fifth Ave., New York 1, N. Y.)

May 21-24—American Society of Mechanical Engineers. Oil and Gas Power 19th National Conference, Cleveland. (Ernest Hartford, executive assistant secretary, A.S.M.E., 29 West 39th St., New York 18, N. Y.)

May 22-31—Mid-America Exposition, Public Auditorium, Cleveland. (John A. Crawford, managing director.)

May 23-24—Electrochemical Society. Annual Spring Symposium of the Pittsburgh Section; Mellon Institute for Industrial Research, Pittsburgh. (G. B. Hatch, % Hall Laboratories, Hagan Bldg., Pittsburgh.)

May 23-24—American Institute of Mining and Metallurgical Engineers, Institute of Metals Division. First Annual Regional Conference on Technology of Metals, Hotel Sheraton, Boston. (H. I. Dixon, chairman of Regional Conference Committee, % Sterling Alloys, Inc., Woburn, Boston, Mass.)

May 27—Metal Powder Association. Third Annual Spring Meeting, Waldorf-Astoria Hotel, New York. (The Association, 420 Lexington Ave., New York 17, N. Y.)

Elongation & Impact Data Given for Six Weld Rods

Reported by R. E. Christin

Chief Metallurgist, Columbus Bolt Works

Before a joint meeting of the Columbus Chapters of A.S.M. and A.W.S. on Feb. 11, Louis J. Larson, welding engineer, Allis-Chalmers Manufacturing Co., Milwaukee, reported results of tests on metallic arc welds. The illustrated talk included data on elongations, impact values and ratings of welds made with A.W.S. 6010, 6011, 6012, 6013, 6020 and 6030 electrodes.

The 6012 and 6013 electrodes produce weld metal with lower ductility and impact values than the high quality rods, and stress relieving produces practically no improvement in these properties when the 6012 electrode is used. For the six types tested, elongation ranges from 15 to 24% in 2 in. as welded and from 17 to 30% when stress relieved. Impact value ranges from 21 to 31 ft-lb. as welded and from 17 to 35 when stress relieved.

The advantages of each grade of rod, benefits of coatings and effects of cooling time before quenching in boiling water were covered in discussion.

CHAPTER MEETING CALENDAR

CHAPTER	DATE	PLACE	SPEAKER	SUBJECT
Baltimore	May 19	Engineers' Club		Nucleonics and the Future of Metallurgy
Birmingham District	May 6		J. R. Ewing	Metal Cleaning
Boston	May 2	Hotel Sheraton		Young Men's Night
Buffalo	May 8	MacDoel's		Annual Meeting
Calumet	May 13	Phil Smidt and Son, Whiting, Ind.	J. D. Eisaman	Electric Furnace Practice
Cedar Rapids	May 7	Hotel Roosevelt	Hans Ernst	Metal Cutting Research
Chicago	May 8	Chicago Bar Association	M. A. Grossmann	Science
Cincinnati	May 9	Clovernook Country Club		Annual Election and Outing
Cleveland	May 5	Cleveland Club	Howard C. Cross	High-Temperature Alloys
Dayton	May 14	Engineers' Club	O. J. Horger	Metallurgy and Design
Des Moines	May 13	Des Moines Technical School		Plastics
Detroit	May 12	Rackham Building	C. L. Stevens	Metallurgical Process Control
Eastern New York	May 13	Circle Inn, Lathams	Zay Jeffries	
Fort Wayne	May 12	Chamber of Commerce		Annual Meeting
Georgia	May 5			
Hartford	May 9	Hotel Bond, Hartford		New England Regional Meeting
Kansas City	May 21	Pine Room		Annual Meeting
Los Alamos	May			Annual Picnic
Mahoning Valley	May 13		B. W. Gonser	Unusual Metals and Their Growing Importance
Milwaukee	May 20	City Club of Milwaukee		Annual Party
Montreal	May 5	Queen's Hotel	A. L. Boegehold	Correlation of Recent Data on Hardenability
Muncie	May 8	The Candle Lite	Hans Ernst	Machinability
New Haven	May 9	Hotel Bond, Hartford		New England Regional Meeting
New Haven	May 15	Hotel Taft	W. A. Purtell	
New Jersey	May 19	Essex House, Newark	Fred P. Peters	The New Science of Metals
New York	May 5	Building Trades Bldg.	Morris Cohen	Tempering of Toolsteels
Northwestern Pennsylvania	May 22	Erie, Pa.	H. W. McQuaid	Inherent Stresses in Steel
Notre Dame	May 14	Engineering Auditorium, Univ. of Notre Dame	C. L. Clark	Application of Steels to High-Temperature Service
Ontario	May 2	St. Catharines, Ont.	John Chipman	New Developments in Metals
Ottawa Valley	May 6	Chateau Laurier	A. L. Boegehold	Correlation of Recent Data on Hardenability
Penn State	May 5	Mineral Industries Bldg.	J. H. Hollomon	
Philadelphia	May 23	Essex House, Newark, N. J.		Tri-State Regional Meeting
Pittsburgh	May 8	Mellon Institute	J. H. Meier	Performance Tests on Large Machinery by Means of Strain Gages
Puget Sound	May 21	Wash. Athletic Club	Joseph Daniels	Sustaining Metals
Rhode Island	May 8		A. L. Boegehold	Correlation of Recent Data on Hardenability
Rochester	May 12	Powers Hotel		Annual Meeting
Rocky Mtn.				
Pueblo	May 8	Whitman Hotel	Howard Stagg	Toolsteels
Denver	May 9	Oxford Hotel	Howard Stagg	Toolsteels
Saginaw	May 20	Fischer's Hotel, Frankenmuth, Mich.	W. Stout	Engineering and Human Problems
San Diego	May 13	San Diego Hotel	D. L. Fox	Under-Water Corrosion
Southern Tier	May 12	Hotel Frederick, Endicott, N. Y.		
Springfield	May 19	Sheraton Hotel	R. H. Thielman	Application of Metals to Jet Propulsion and Gas Turbines
St. Louis	May 16		C. T. Evans, Jr.	Heat Resisting Alloys for Gas Turbines
Syracuse	May 10	Paul Dawson's Hotel, Liverpool, N. Y.		Annual Meeting
Terre Haute	May 12	Indiana State Student Union Bldg.		Magnesium From the Sea and Working of Magnesium
Toledo	May 28		R. J. Cowan	Gases in Metals
Tri-City	May 5		Frank Ross	Lubrication
Tulsa	May 13		H. W. McQuaid	What the Engineer Should Know About Metallurgy and Why
Washington	May 12		A. L. Boegehold	Correlation of Recent Data on Hardenability
West Michigan	May 19	Rowe Hotel	H. W. McQuaid	Metallurgical Factors in Processing Steel
York	May 14	Gettysburg	H. B. North	Tungsten—The Ore, Its Metallurgy and Its Compounds

between 0.010 and 0.118-in.; and most of the even fractional dimensions. For any given outside diameter between ⅛ in. and 4½ in., all of these gage sizes may be found which fall within the index extremes of 3 and 20. Odd wire sizes or nonferrous materials may also be handled with little additional work.

24-87. A New Criterion for the Design of Wire Ropes. M. Ten Bosch. *Engineers' Digest (American Edition)*, v. 4, Feb. 1947. p. 67-69.

Equations for use in design and estimation of the life of steel wire ropes. (Condensed from *Schweizerische Bauzeitung*, v. 128, Nov. 9, 1946, p. 237-239.)

24-88. Tooling Dock Simplifies Building Assembly Fixtures. Leland A. Bryant. *Iron Age*, v. 159, March 20, 1947, p. 60-62.

Applicable to a wide variety of large structures such as automobiles, aircraft and railroad cars. By means of longitudinal, vertical and transverse straightedges, any point in space can be accurately located without the use of conventional measuring instruments, and any number of exactly similar fixtures may ,be constructed without danger of human error or accumulation of tolerances.

24-89. Designing Tools for Screw Machine Production. Part VII. *Screw Machine Engineering*, v. 8, March 1947, p. 36-38.

Drills, flat counterbores and spiral-relieved end-cutting tools.

24-90. Wire Strain Gages Relate Shaft Torque. *SAE Journal*, v. 55, March 1947, p. 66.

Resistance wire strain gages used for measuring static stresses adapted to torque measurement of engine shafts. Drawing shows how torque-sensitive strain gages are attached to a shaft to form a Wheatstone bridge circuit. Measuring torque with this configuration eliminates disturbances from bending, thrust or pull, temperature variation, and changes in resistance at brush contacts. (Digest of paper "Equipment for Separately Measuring Power in the Cylinder Shaft, Threshing Machinery and Sickle Bar Components of Combine Harvesters," by A. C. Ruge, J. H. Meier and C. H. Gibbons.)

24-91. Design for Sheet Metal Boxes With Square and Round Corners. Part II. Wallace C. Mills. *Product Engineering*, v. 18, March 1947, p. 122-123.

Designs incorporating tabs, hems, and reinforcements.

For additional annotations indexed in other sections, see:
3-63; **9**-36; **12**-40; **23**-58-76; **27**-53-56.

DESIGN for WELDING
For Latest News of Design and Methods to cut costs with resistance welding ask for the monthly WELDING PICTORIAL
Progressive Welder Co. Detroit 12, Mich.

25 MISCELLANEOUS

25-30. Survey of Metallurgical Research in Japan During the War. S. A. Herres. *Metal Progress*, v. 51, Feb. 1947, p. 273-290.

Abridgment of complete report gives a good view of the scientific and technical condition in this enemy country during the years 1940-1945.

25-31. Production Applications of Electronics. *Machinery (London)*, v. 70, Jan. 16, 1947, p. 76-78.

Speed and torque regulation of motors; high-frequency induction heating; electronic control for resistance welding.

25-32. Metallurgical Progress and the Rubber Industry. *India-Rubber Journal*, v. 112, Feb. 1, 1947, p. 155-156, 159.

Recent developments in production of stainless clad steels; nitrocellulose proofing of textiles; new field for acrylonitrile; rubber torsion springs; dyeing thermoplastics; Plastazote in aircraft construction; silicone as mold lubricant; bonding with thermosetting plastic; a new filter medium made of stainless steel powder.

25-33. Handling and Processing Chips and Scrap. John E. Hyler. *Machine and Tool Blue Book*, v. 43, Feb. 1947, p. 202-204, 206-208, 210, 212-214, 216, 218, 220, 222, 224, 226.

Various methods used to remove chips and scraps from machines. Lift trucks, conveyers, magnets and other loading equipment are mentioned. Necessity of completely removing all oil from chips is strongly stressed. Briquetting is briefly touched upon.

25-34. Review of Iron and Steel Literature for 1946. E. H. McClelland. *Blast Furnace and Steel Plant*, v. 35, Feb. 1947, p. 227-229.

Thirtieth annual review of iron and steel literature. Books and pamphlets published during 1946, with a few of earlier date not included in the previous review.

25-35. War Effects on the German Steel Industry. Julius E. Graf. *Iron and Steel Engineer*, v. 24, Feb. 1947, p. 53-57; discussion, p. 57-58.

Steelmaking capacity; plants geared to use ores imported from Sweden; description of Herman Goering works near Salzgitter; welding technique; tubing production; estimate of post-war potentialities.

25-36. Discussion on Steelworks Locomotives—Diesel Versus Steam. *Journal of the Iron and Steel Institute*, v. 155, Jan. 1947, p. 88-106.

Discussion at meeting of the Iron and Steel Engineers Group of the Iron and Steel Institute, London, Oct. 16, 1946. Advantages and disadvantages of both types for steelworks transportation problems.

25-37. First Annual Report July 1st, 1945 to June 30th, 1946. *The Council of The Motor Industry Research Association, Brentford, Middlesex, England*, Dec. 1946, 61 p.

The various research programs of the association include: filtration of used lubricating oils, performance of bearings and bearing materials, fatigue strength of crankshafts, durability of gears, deep-drawing properties of sheet metals, engine performance with leaded fuels, electrical strain gages, piston ring design, stiffness in frames, stresses in frames, fuel injection, and cylinder-head design.

25-38. Germanium and Its Compounds. A. G. Arend. *Industrial Chemist*, v. 23, Feb. 1947, p. 77-82.

Sources, production methods, properties and applications.

25-39. Copper in 1946. James Douglas. *Mining Congress Journal*, v. 33, Feb. 1947, p. 63-66.

1946 developments and 1947 prospects.

25-40. Do You Have a Coil Handling Problem? *Flow*, v. 2, March 1947, p. 20-22.

Materials handling system for movement of hot rolled coiled rods for mass production in wiredrawing operations at National Screw & Mfg. Co., Cleveland.

25-41. Aluminum Developments. S. A. J. Sage. *Metallurgia*, v. 35, Feb. 1947, p. 193-196.

Some of the metallurgical advances made in the aluminum industry during the war including increased rate of extraction of alumina from bauxite, greatly increased production of super-purity aluminum for the production of high-strength alloys, cladding of extrusions, continuous and semicontinuous billet casting, casting alloys, mechanized foundries, surface finishes, and inspection.

25-42. The Everchanging Picture in Materials and Processing Equipment. *Steel Processing*, v. 33, Feb. 1947, p. 98-100.

Adherence to traditional materials, methods and equipment keeps quality low and costs up in many instances. Expansion in the knowledge of and use of toolsteels, stainless steels, clad steels.

25-43. Aluminum Therapy and Silicosis Prevention. Part I. Medical Aspects. W. D. Robson. *Transactions of the Canadian Institute of Mining and Metallurgy*, v. 50, Feb. 1947, p. 57-67. (Bound with *Canadian Mining and Metallurgical Bulletin.*)

Experimentation, recommended preventive uses of aluminum dust and recommended therapeutic treatments.

25-44. Aluminum Therapy and Silicosis Prevention. Part II. Engineering Aspects. A. W. Jacob. *Transactions of the Canadian Institute of Mining and Metallurgy*, v. 50, Feb. 1947, p. 68-83. (Bound with *Canadian Mining and Metallurgical Bulletin.*)

Type of powder used, supervision of the treatment, the filter-paper sampler, and methods used to treat individuals already affected with silicosis, using more concentrated doses.

25-45. Developments in Aircraft Materials and Processes. Paul E. Lamoureux. *Transactions of the Canadian Institute of Mining and Metallurgy*, v. 50, Feb. 1947, p. 104-126. (Bound with *Canadian Mining and Metallurgical Bulletin.*)

Aluminum alloys; steel; superalloys for gas turbines; wood; plastics; adhesives; fuels; lubricants; synthetic rubber; shot-peening; protection against corrosion; X-ray inspection; heat treatment; cold treatment; electroplating.

26 STATISTICS

26-36. Minerals as a Factor in U. S. Foreign Economic Policy. Paul H. Nitze. *Department of State Bulletin*, v. 16, Feb. 16, 1947, p. 300-302.

Trade agreements program as it concerns the mineral industry.

26-37. C.P.A. Trims O.I.T.'s Tinplate Allocation Request to 55,000 Tons. Gene Hardy. *Iron Age*, v. 159, Feb. 27, 1947, p. 108-109.

Tinplate exports and allocations for 1946 and first part of 1947.

26-38. Lake Superior Iron Ore Reserves for the Future Operation of the U. S. Iron and Steel Industry. George W. Hewitt. *Skillings' Mining Review*, v. 35, March 1, 1947, p. 1-2, 4, 6, 9, 13, 15.

Discussion and statistical tabulations.

26-39. Pricing Castings for Profit. (Concluded.) Joseph B. Meier. *Foundry*, v. 75, March 1947, p. 108-109, 243-248.

Direct and indirect expenses and the profit factor.

26-40. The Aluminum Industry of India. *Aluminium and the Non-Ferrous Review*, v. 11, Oct-Dec. 1946, p. 74-75.

The organization of the aluminum fabrication companies. Importation and distribution of aluminum. Government aid and control.

26-41. Production of Alumina by the Lime Soda Process. Parts I and II. W. E. Prytherch, M. L. R. Harkness and W. D. Spencer. *Chemical Age*, v. 56, Jan. 25, 1947, p. 149-153; Feb. 8, 1947, p. 219-223.

Part I is mainly devoted to a discussion of world bauxite reserves, production of aluminum, imports and exports, for each country of importance. Part II gives details of the composi-

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International Nickel Distributes Technical Data to Colleges

A broadening of International Nickel Co.'s cooperation with universities and colleges in the United States and Canada in the field of engineering education through the distribution of technical literature is announced by T. H. Wickenden, manager of the development and research division.

Under the new program each institution will be furnished an exhibit containing approximately 50 specimens of nickel-containing materials; a portable metals identification kit containing some 35 specimens of important metals and alloys for qualitative identification of metals and alloys (spot testing); literature and other technical and practical information concerning nickel and its alloys, and other data. Motion pictures of the company's mining, smelting and refining operations will be available.

WANTED: Automatic or semi-automatic plating conveyor for galvanizing and nickelling for small pieces. Write, giving price and information to: American Union Transport, Inc., 17 Battery Place, New York 4, N. Y.

FOR SALE—One slightly used, Model No. 730, Philips Ray-Protected, Self Contained, Industrial Radiographic Fluoroscopic Unit of 150 KVP-MA Capacity. Address Box 4-1, Metals Review.

EMPLOYMENT SERVICE BUREAU

The Employment Service Bureau is operated as a service to members of the American Society for Metals and no charge is made for advertising insertions. The "Positions Wanted" column, however, is restricted to members in good standing of the A.S.M. Ads are limited to 50 words and only one insertion of any one ad will be printed. Address answers care of A.S.M., 7301 Euclid Ave., Cleveland 3, Ohio, unless otherwise stated.

POSITIONS OPEN

South America

METALLURGIST: With at least 10 yr. exp. in steel foundry operations for fdry. of railroad equipment co. Must have excellent health and be willing to sign a 2-yr. contract. Available to leave this country in 6 to 8 weeks. Brazilian Railroad Equipment Co., c/o Giffels & Vallet, Inc., 1000 Marquette Building, Detroit 26, Mich.

East

FOREMAN: Capable and experienced in the manufacture and heat treatment of high speed hack-saw blades and band saws. Required to direct production of about 50 people. Reply stating age, past experience and salary expected. Location, New England. Box 4-5.

SALES AND DEVELOPMENT ENGINEER: Wanted by manufacturer of stainless steel strip, wire and rod. Opportunities for advancement are limited only by capabilities of successful applicant. Both recent graduates and those with met., chem, or mech eng. exp. will be considered. Box 4-10.

METALLURGICAL PHYSICIST: Ph.D. or equivalent. Needed for institutional research on the grinding and finishing of metals with particular emphasis on the cause and avoidance of defects caused by such operations. Middle Atlantic location. Box 4-15.

Midwest

MACHINE DESIGNER: Experienced on heavy structural fabricating shop equipment; also on rebuilding, redesigning and stress analyzing such equipment as multiple punches, heavy plate shears, and miscellaneous machines. Century-old steel firm, Chicago, with branch plants from coast to coast. Write full details stating age, experience and salary expected. Box 4-120.

Southeast

METALLURGICAL AND WELDING ENGINEER: Location Oak Ridge, Tenn. Metallurgist with some lab. experience on stress analysis due to heat effect of welding on carbon and alloy steels, one to two years shop experience on actual welding techniques or the development of special techniques on carbon and alloy steels. Box 4-125.

Southwest

TEACHER OF METALLURGY: In Texas Salary $3100 to $5000 depending on qualifications. Phys. met. teaching and research. Age 27 to 45. Box 4-20.

POSITIONS WANTED

PRODUCTION MANAGER: New York area. Age 36. 15 yr. industrial exp. in plastics; compression molding; powdered metals of close tolerance parts, such as cams, gears, magnetic poles; quality and production control; expediting, work load and manpower evaluation. Excellent in labor relations. Available on short notice. Box 4-25.

METALLURGICAL-WELDING ENGINEER: B.S. Purdue, 1940; M.S. Rensselaer Polytechnic, 1947. Married, age 29, 1½ yr. exp. in alloy steel manufacture. Recently discharged from the Army. Desires responsible position in development, sales eng. or production, particularly with co. concerned with welding. Box 4-30.

METALLURGIST: Age 31. B.S. and graduate study. 13 yr. diversified industrial exp. involving fdry., forging and heat treating (ferrous and nonferrous). Desires responsibility leading to future executive position. Box 4-35.

METALLURGICAL ENGINEER: Married; age 24. 3½ yr. exp. in research and development work, including new fusion piercing process, secondary oil recovery (field work requiring eng. report writing), and structural design. Interested in ore beneficiation and exploitation of low grade ore deposits. Knowledge of mining and geology. Prefers western or southwestern location. Box 4-40.

METALLURGIST: Age 33. 10 yr. in steel industry with 3 yr. exp. in leading steel research lab. specializing in all phases of heat treatment. 6 yr. in met. and research supervision for wire and spring plants. Desires responsible met. or research position in leading spring co., preferably in the East or Midwest. References. Box 4-45.

HIGH-TEMPERATURE ALLOY METALLURGIST AND CHEMICAL ENGINEER: M.S. degree. 31 years of age. 2 yr. exp. as chem. engr., 1 yr. as food plant manager, 6 yr. diversified exp. as metallurgist in the development and application of ferrous and nonferrous alloys for the aircraft gas turbine industry. Qualified to supervise a control lab. or participate in the research and development of superalloys. Box 4-50.

METALLURGICAL ENGINEER: Major in chem. and met. eng., minor in industrial eng. B.S. 1942, M.S. 1947. 4 yr. intensive exp. in production control and general eng. involving met. research and development. Grad. research on gold alloy fabrication. Fellowship student with teaching exp. Available this June. Desires permanent position of responsbility with commensurate salary. Box 4-55.

ENGINEER: Age 42. 20 yr. mech., met., tool and production eng. exp. Desires responsible supervisory or administrative position. Thoroughly exp. in forging, stamping, fabrication and heat treatment of metals, machine shop operations, equipment design and all plant operations. Job evaluation, merit rating, methods improvement, operation sheets Box 4-60.

METALLURGICAL ENGINEER: Age 28, married. Grad. Michigan College of Mining & Technology, 1941, B.S. in met. eng. 1 yr. metallurgist large eastern forge plant. 4 yr. officer Eng. Corp. 1 yr. shift superintendent nonferrous smelter and refiner. Interested in a position with opportunity of advancement. Sales considered. Now located in Chicago. Box 4-65.

MANUFACTURING EXECUTIVE: Desires position where his broad exp. can help meet competitive conditions ahead. Grad. engr. with exp. in operating fdry., machine shops and fabricating shops. Box 4-70.

WANTED
GENERAL PLANT SUPERINTENDENT

Excellent opportunity for man with good metallurgical background, proved administrative ability, and experience in smelting or foundry operations, preferably light metals. Write giving full details. Box 4-115.

METALLURGICAL ENGINEER: Age 36. B.S. Met. E. Desires position as chief metallurgist or executive assistant. 2 yr. exp. as production manager of met. mfg. division. 7 yr. exp. as development metallurgist on diverse met. problems. Has patents pending; original ideas. Prefers New York City area or New England. Salary $6500. Box 4-75.

METALLURGICAL SALES ENGINEER: B.S., Ch.E. and Met. E. Age 28, married. 6 yr. diversified met. exp. in production and sales. Desires sales eng. position with progressive co. Location immaterial. Available now. Box 4-80.

ASSISTANT TO GENERAL MANAGER: or superintendent in machine or job shop. 20 yr. exp. in machine trade. Expert along grinding lines and knows modern machining methods. Excellent references. Member A.S.M. and A.S.T.E. Resume submitted on request. Box 4-85.

ENGINEER: 32 yr. exp. machine tool mfg. Tool, die, machine, adding machine designing. Toolroom, maintenance, production supervision. Production, process and methods engineering. Chief estimator ferrous and nonferrous metal stampings and finishing. Some exp. welding and forgings. Age 50. Excellent health. Midwest or foreign location. Colorado licensed mech. engr. Box 4-90.

METALLURGIST: Age 27, married. B.S. in met. with considerable grad. work. 6 yr. exp. in steel mill developments process control and met. supervisory work. Desires responsible position with opportunity for advancement. No preference in location. Box 4-95.

METALLURGICAL ENGINEER: B. Met. Eng. 3½ yr. varied exp. in heat treatment, machine shop, steel rolling mill, parts failure study, quality control and specification writing. Some supervisory. Desires position as materials, methods or met. engr. in Cleveland area. At present employed as met. engr. Good at meeting people. Box 4-100.

METALLURGIST: B.S.,Ch.E. Age 35, married. 10 yr. steel mill and 2 yr. mfg. exp. Process control and research lab. supervisory exp. Proficient in technical writing, drawing and service failure investigations. Desires permanent position in Los Angeles area. Box 4-105.

METALLURGIST—DEVELOPMENT ENGINEER: Trouble shooting and research. M.S. in met. eng. 10 yr. diversified exp. in ferrous met. Development of new and better alloys, heat treating and testing procedures for low-alloy, constructional, special tool, stainless and high-alloy steels and alloy castings, including superalloys. Investigational work leading to improvement in quality, lowered cost and more satisfied customers. Box 4-110.

EXECUTIVE OR TRAVELING: Purchasing, expediting or sales. Engineering and metallurgical background. Wide shop exp. in production of forgings, castings and mill products; heat treating of carbon and alloy steels. Excellent record as trouble shooter and liaison man between purchasing, engineering and production. Now in East but location immaterial. Box 4-130.

METALLURGICAL ENGINEER: Age 27, married, M.A. Sc. Canadian army veteran. 2 yr. exp. induction hardening setups, foundry and heat treat trouble shooting for research organization. Also exp. in zinc, cadmium, manganese electrometallurgy development. Good expeditor, organizer. Western Canadian contacts. Will accept domestic or foreign assignment, sales or production. Box 4-135.

tion of various bauxite and alumina-containing shale deposits of the British Isles. Possibility of obtaining alumina from the ash content of shales. Amount of various hydrocarbon products obtained on distillation of the shale. (To be continued.)

26-42. Production of Magnesium Rises With Increasing Utilization. A. M. Tedford. *Canadian Chemistry and Process Industries*, v. 31, Feb. 1947, p. 137-138, 141.

Beginnings of the industry and its spread. Raw materials. Effect of the war. Advantages of magnesium and applications.

26-43. Iron Ore and Beneficiation. Grover J. Holt. *Mining Congress Journal*, v. 33, Feb. 1947, p. 67, 70-73, 91.

1946 production and development. Ore shipments 1942-1946.

26-44. Gold Mining in the Doldrums. Neil O'Donnell. *Mining Congress Journal*, v. 33, Feb. 1947, p. 79-82, 95.

Recent developments and future trends.

26-45. The Lead Market in 1946. Irwin H. Cornell. *Mining Congress Journal*, v. 33, Feb. 1947, p. 74-75.

1946 developments and 1947 trends.

26-46. Zinc. Russell B. Paul. *Mining Congress Journal*, v. 33, Feb. 1947, p. 76-78.

1946 developments and 1947 trends.

26-47. Silver at the Crossroads. *Mining Congress Journal*, v. 33, Feb. 1947, p. 83-86.

Effect of foreign and domestic governmental regulations and international agreements.

26-48. Aluminum and Bauxite. *Mining Congress Journal*, v. 33, Feb. 1947, p. 87-89.

1946 developments and 1947 trends.

26-49. Magnesium in 1946. L. M. Oldt. *Mining Congress Journal*, v. 33, Feb. 1947, p. 89-91.

1946 developments and 1947 trends.

26-50. Antimony. James P. Bradley. *Mining Congress Journal*, v. 33, Feb. 1947, p. 92-93.

1946 developments and 1947 trends.

26-51. The Outlook for Quicksilver. S H. Silliston. *Mining Congress Journal*, v. 33, Feb. 1947, p. 94-95.

1946 developments and 1947 trends.

26-52. Alloy Metal Ores in 1946. Blair Burwell. *Mining Congress Journal*, v. 33, Feb. 1947, p. 96-97.

1946 developments and 1947 trends in tungsten, vanadium, cobalt, chromium, molybdenum, manganese, and nickel.

26-53. Prospects for Copper, Lead, and Tin in 1947. Jacob Levin. *Domestic Commerce*, v. 35, March 1947, p. 46-50.

A survey.

26-54. U. S. Iron Ore Output at 71,214,000 Tons in 1946. *Skillings' Mining Review*, v. 35, March 22, 1947, p. 1-2.

Tables give production by districts for 1942-46, and iron ore imports by countries for 1946.

For additional annotations indexed in other sections, see: 1-37; 2-25; 15-7.

27 NEW BOOKS

27-50. Oxidation of Metals at Elevated Temperatures. V. I. Archarov. 136 p., 1945. State Scientific-Technical Publishing House for Ferrous and Nonferrous Metallurgy, Moscow, U.S.S.R. (In Russian.)

A qualitative study of the phenomena involved in oxidation of metals, including a representation of the process on a microscopic scale; several fundamental conclusions. The approach is in contrast to the usual quantitative empirical method.

27-51. Alloys With High Coercive Characteristics. B. G. Livschitz. 122 p., 1945. State Scientific-Technical Publishing House for Ferrous and Nonferrous Metallurgy, Moscow, U.S.S.R. (In Russian.)

Review of present state of the knowledge; fundamental data on the influence of the individual components upon magnetic properties of the commonly used alloys. Results of a thorough investigation of the theory of heat treatment of such alloys in connection with the Fe-Al-Ni constitutional diagram, crystal structure, and metastable state. Production processes, application methods, test techniques.

27-52. The Wimet Tool Manual. 92 p. A. C. Wickman, Ltd., Coventry, England. 10s, 6p.

Handbook compiled by the three branches of this firm on the manufacture of sintered carbides. The various grades produced at present and their physical properties. Design of sintered carbide tipped tools. Brazing and grinding of tool tips.

27-53. Jig and Fixture Design. Volume I. A Suggested Unit Course in Jig and Fixture Design. 339 p. American Society of Tool Engineers, 1666 Penobscot Bldg., Detroit, Mich. $7.50.

Tool design principles and practices. Among topics discussed are: introduction to tool design; function of jigs and fixtures; jig and fixture design; how designs of jigs and fixtures are planned; tool drawing. Five complete units of instruction deal with the design of one or more types of jigs and fixtures.

27-54. Laboratory Manual in Metallography. John F. Eckel and Robert J. Randebaugh. 344 p. McGraw-Hill Book Co., Inc., 330 W. 42nd St., New York, N. Y. $4.50.

Experiments to present the necessary techniques in metallurgy; the general fundamental principles involved in mechanical and thermal treatment of alloys; the common treatments of representative nonferrous alloys; and the common treatments of representative ferrous alloys.

27-55. Dictionary of Machine Shop Terms. Arthur C. Telford. 282 p. American Technical Society, Drexel Ave. at 58th St., Chicago, Ill. $.75.

Pocket size book of definitions, in the language of the trade, of thousands of terms used in machine shop and related activities.

27-56. Machine Design. Edition 5. L. J. Bradford and P. B. Eaton. 86 p. Metallizing Engineering Co., Inc., Long Island, N. Y. $2.00.

Includes new material on the fatigue of metals, current theories on the nature of friction and lubrication, and special precautions necessary in designing parts made of aluminum.

27-57. Saws and Sawing Machinery. Eric N. Simons. 210 p., 1946. Sir Isaac Pitman & Sons, Ltd., Parker St., Kingsway, London, England. 15s.

Opening chapter outlines the function of saws and is mainly concerned with wood-cutting. Following chapters deal with handsaws, circular saws for wood and metal, inserted tooth and segmental saws, diamond-toothed saws, the hacksaw and bandsaws. Upkeep and maintenance of saws and various types of machines.

27-58. Steel Manufacture. Edwin Gregory and Eric N. Simons. 205 p., 1946. Sir Isaac Pitman & Sons, Ltd., Parker St., Kingsway, London, W.C.2, England.

Attempts to describe steel manufacture in a clear and concise manner, which the layman or student can readily understand. However, it is written mainly from the point of view of British industry.

27-59. Examination of Industrial Measurements. John W. Dudley, Jr. 113 p. McGraw-Hill Book Co., Inc., 330 W. 42nd St., New York, N. Y. $2.00.

Simple and adaptable statistical techniques for detection of variation in industrial products. Important types of data which reveal causes of variation and effective methods for collecting, analyzing and presenting them. How to construct control charts, make quartile analyses, and analyze the limitations of curves made from industrial or engineering data.

27-60. A Bibliography on Die Casting, 1910-1946. 74 p. Technical Publishing Company, 1240 Ontario St., Cleveland, Ohio. $7.50.

Items are classified under nine headings, and arranged according to author in each section. Also contains a classified index to *Die Castings*.

27-61. The Design and Methods of Construction of Welded Steel Merchant Vessels. 164 p., July 1946. U. S. Government Printing Office, Washington 25, D. C.

Final report of a board of investigation appointed by the Secretary of Navy in April 1943. A short introductory section summarizes design, materials, construction, operating conditions, specific investigations, international exchange of information, findings, conclusions, opinions, and recommendations. The bulk of the information is in three "exhibits": Statistical Report of Structural Failures on Welded Steel Merchant Vessels (giving details of each case, including pictures of the damaged ships); Summary of Research Investigations; and Survey of Shipyard Welding Practices.

27-62. Copper Data. 72 p. Copper Development Association, London, England.

Selected information believed to be most valuable to the commercial user.

27-63. Mineral Dressing Notes. No. 15. 44 p. American Cyanamid Co., New York, N. Y.

A revision of the information presented in "Ore Dressing Notes—No. 7", published seven years ago. Characteristics and uses of the flotation reagents offered by Cyanamid. A brief description of flotation processes using the reagents mentioned, together with techniques of selective flotation of common base metal sulphide minerals and beneficiation of many nonmetallic ores. Average quantities of reagents fed to flotation circuits, method of feeding, points of addition, and minerals on which the various reagents are most effective presented in tabular form. 38 ref.

27-64. Manufacturing Processes. Edition 2. Myron L. Begeman. 635 p., 1947. John Wiley & Sons, Inc., 440 Fourth Ave., New York 16, N. Y. $5.00.

Brought up to date throughout in regard to newly designed machines and tools. New chapters have been added on special casting methods, powder metallurgy, hot forming of metals and cold forming of metals; the chapter on plastic molding has been rewritten, and much of the material on welding and allied processes.

27-65. Welding Symbols. 115 p. The Bruce Publishing Co., 540 N. Milwaukee St., Milwaukee 1, Wis. $2.50.

Standards and symbols are those recognized by the American Welding Society, including those for arc and gas welding as well as resistance.

27-66. Finishes for Aluminum. (In Two Parts.) 228 p. Reynolds Metals Co., 2500 So. Third St., Louisville 1, Ky. $2.00.

Cleaning treatments; mechanical surface finishes; chemical surface finishes; electrolytic oxide treatments; electroplated coatings; paint application methods; paint coatings; ceramic coatings; special finishes such as silk screen and sprayed metal finishes. Shop data on materials, equipment, solution preparation and procedure.

MATERIALS INDEX - CURRENT LITERATURE

The following tabulation classifies the articles annotated in the A.S.M. Review of Current Metal Literature according to the metal or alloy concerned. The articles are designated by section and number. The section number appears in bold face type and the number of the article in light face.

General Ferrous

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Use this convenient method to obtain further information on items of interest to you in METALS REVIEW. The following numbers refer to the new products and manufacturers' literature in this issue.

Metals Review, April 1947

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NEW PRODUCTS IN REVIEW

CASTINGS, PRECISION

Twenty-page booklet presents illustrated information on successful precision casting processes utilizing Kerr equipment, along with a description and specifications of the machines necessary to achieve precision with volume production. Materials developed during more than half a century of casting in the dental, jewelry and industrial field are described. Basic steps in the casting process are photographed.

KERR MFG. CO.,
Detroit 8, Mich.

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CLEANING, METAL

Eight-page leaflet describes D'Oiler degreasers. Each unit is designed to satisfy a specific need. Heat sources—steam, electricity or gas—are designed in the equipment to provide every safety precaution. These vapor degreasers feature drain table to save solvent; built-in exhaust duct for safety; quick, easy cleaning; automatic feed for make-up solvent; and replaceable cellular condenser for more condensing surface.

MECHANICAL PROCESS CO.,
South Orange, N. J.

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CLEANER, METAL

Four-page leaflet describes "Duridine" as the modern metal cleaner and conditioner. With it, metal surfaces can be simultaneously cleaned and phosphate coated for painting. Combined operations save time and labor.

AMERICAN CHEMICAL PAINT CO.,
Ambler, Pa.

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ELECTRODE, AUTOMATIC

Supplementing the Airco brand of manual electrodes, this group of automatic arc welding wires and tapes embraces five knurled-type wires and five tapes, all for flat-position operation. Their applications on the production line range from thin sheet metal forms to boilers, axle housings, and torque tubes.

All wires and tapes have been subjected to extensive tests. They are manufactured in several diameters and are designed to meet the general requirements of high-speed production welding.

AIR REDUCTION SALES CO.,
60 East 42nd St.,
New York 17, N. Y.

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GUN, HARD FACING

Four-page leaflet describes new Spraywelder gun for use with powdered hard facing alloys in conjunction with the Colmonoy process. There are no complicated controls; once adjusted, the Spraywelder maintains a constant, steady flow of powder. The process combines the advantages of welding and metallizing practice.

WALL COLMONOY CORP.,
Fisher Bldg.,
Detroit 2, Mich.

Mention R-441 for Reader Service

OILS, INDUSTRIAL

Four-page leaflet lists and describes ten Sun products for industry, including cutting oils, solvents and waxes.

SUN OIL CO.,
Industrial Products Dept.,
Philadelphia 3, Pa.

Mention R-442 for Reader Service

WIRE, THERMOCOUPLE

Specifications and recommendations for thermocouple lead wires for pyrometers are charted in a 4-page leaflet.

THERMO ELECTRIC CO.,
Fair Lawn, N. J.

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INSTITUTE OF METALS MONOGRAPHS

No. 1.—The Structure of Metals and Alloys. By W. Hume-Rothery, M.A., D.Sc., F.R.S. (Lecturer in Metallurgical Chemistry, Oxford University). Fourth reprint. 137 pages, with 61 figs. Cloth binding. 4s. 6d., post free.

No. 2.—Bibliography of the Literature Relating to Constitutional Diagrams of Alloys. With Supplement. By J. L. Haughton, D.Sc. (Late of the British National Physical Laboratory). 163+14 pages. Limp cloth. 4s., post free.

No. 3.—Atomic Theory for Students of Metallurgy. By W. Hume-Rothery, M.A., D.Sc., F.R.S. Second, revised, edition. 1947. 288 pages, with 124 figs. Cloth binding. 7s. 6d., post free.

No. 4.—An Introduction to the Electron Theory of Metals. By G. V. Raynor, M.A., D. Phil. (Research Fellow in Theoretical Metallurgy, Birmingham University). 100 pages, with 68 figs. Cloth binding. *Now printing.* 7s. 6d., net.

Specially commissioned to be written by acknowledged authorities, and published at low cost, these books survey their respective fields of fundamental knowledge in a masterly way and with the minimum use of mathematical technique and symbolism. They should be possessed by every metallurgist who wishes to understand the scientific background of his work.

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Stripper S-45 is a slightly viscous liquid that can be brushed, sprayed or applied to the work by dipping. It contains a nonwaxy evaporating retardent that keeps the stripper on the work until action is completed. Stripping is accomplished by a wrinkling action so that the enamel can be brushed, wiped, or scraped off. No waxy residue is left to interfere with adhesion of subsequently applied finishes.

The stripper is said to have fast action on most synthetic enamels as well as certain nitrocellulose coatings. It is not satisfactory for linseed oil paints, phenol formaldehyde enamels or vinyl-type coatings. Modified urea formaldehyde, melamine, and alkyd coatings are rapidly stripped. The stripper has no harmful action on metals, plastic, or wood.

ENTHONE, INC.,
Dept. MTR, 442 Elm St.,
New Haven, Conn.
Mention R-444 for Reader Service

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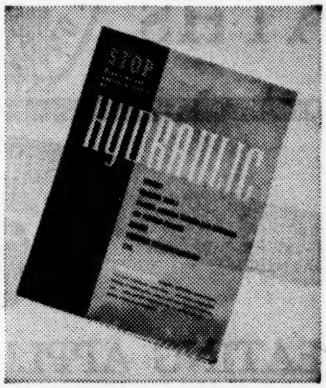
OILS, PURIFICATION

New four-page folder is intended to point out to operators the way to stop downtime and expensive repairs on hydraulic presses, machine tools, die-casting presses, balers and injection



molding machines, by effective purification of hydraulic oils.

The folder discusses first the common forms of contamination which cause hydraulic equipment to operate inefficiently, and reasons for the presence of such contamination in the oil. Follows an explanation of Honan-Crane oil purification and what it accomplishes in the way of removing all forms of contamination.

HONAN-CRANE CORP.,
648 Wabash St.,
Lebanon, Ind.
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LADLES

A 48-page booklet gives detailed and illustrated information on Whiting ladles, including ladle handlers, gear brackets, types of ladles, bottom-tap ladles, ladle preheaters, ladle capacities, ladles for nonferrous materials. Illustrations include photographs and cross-section views. Specifications are included.

WHITING CORP.,
Harvey, Ill.
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Bulletin describes "Super-Soak" metal parts washer of simple automatic design, using the active soak and wash method. Specially designed, heavy steel plate tank equipped with a ¼-hp. motor operates a simple, mechanical lever mechanism attached to the loading tray, automatically and slowly lowering and raising the tray into and out of the soaking solution.

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TOOLS, CARBIDE

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NEW ENGLAND CARBIDE
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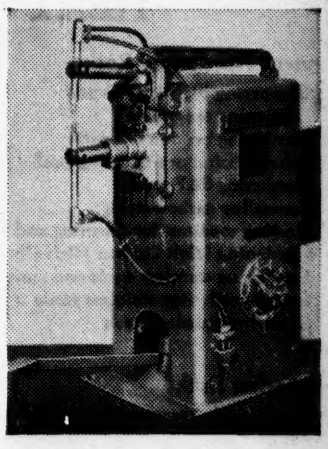

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WELDER CO.,
Lynn, Mass.
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8. Hardening High Carbon High Chrome steels
9. Hardening stainless steels and cutlery
10. Bright hardening stainless steels
11. Descaling stainless steels

Tempering Baths

1. Precipitation treatment of aluminum alloys
2. Tempering production parts and tool steels
3. Hardening Beryllium alloys
4. Martempering production parts

Austempering, Martempering and Isothermal Baths

1. Hardening tool and SAE steels
2. Annealing SAE steels
3. Controlled quenching to eliminate distortion
4. Quenching SAE steels
5. Austempering
6. Hot quenching stainless steels
7. Quenching production parts

Annealing Baths

1. Annealing brass and copper
2. Annealing nickel silver
3. Annealing silver
4. Annealing gold and platinum, and other precious metals at above 1000° F.

High Speed Steel Baths

1. Preheating high speed steels
2. Hardening tool steels
3. Hardening steel production parts

Secondary Hardening of High Speed Steels

1. Increase surface hardness of high speed tools
2. Remedy for soft skin due to faulty hardening
3. Increase life of high speed steel tools 300%

Bluing and Blacking Baths

1. Bluing and blacking production parts

Bright Temper and Descaling Bath

1. Bright tempering steel parts
2. Descaling steel parts

Carburizing Baths

1. Rapid carburizing from 0.001–0.040" depth
2. Rapid heating of dies, etc., for hardening where soft skin occurs
3. Carburizing to a depth of 0.050" or more

Brazing Baths

1. Copper
2. Brass
3. Silver

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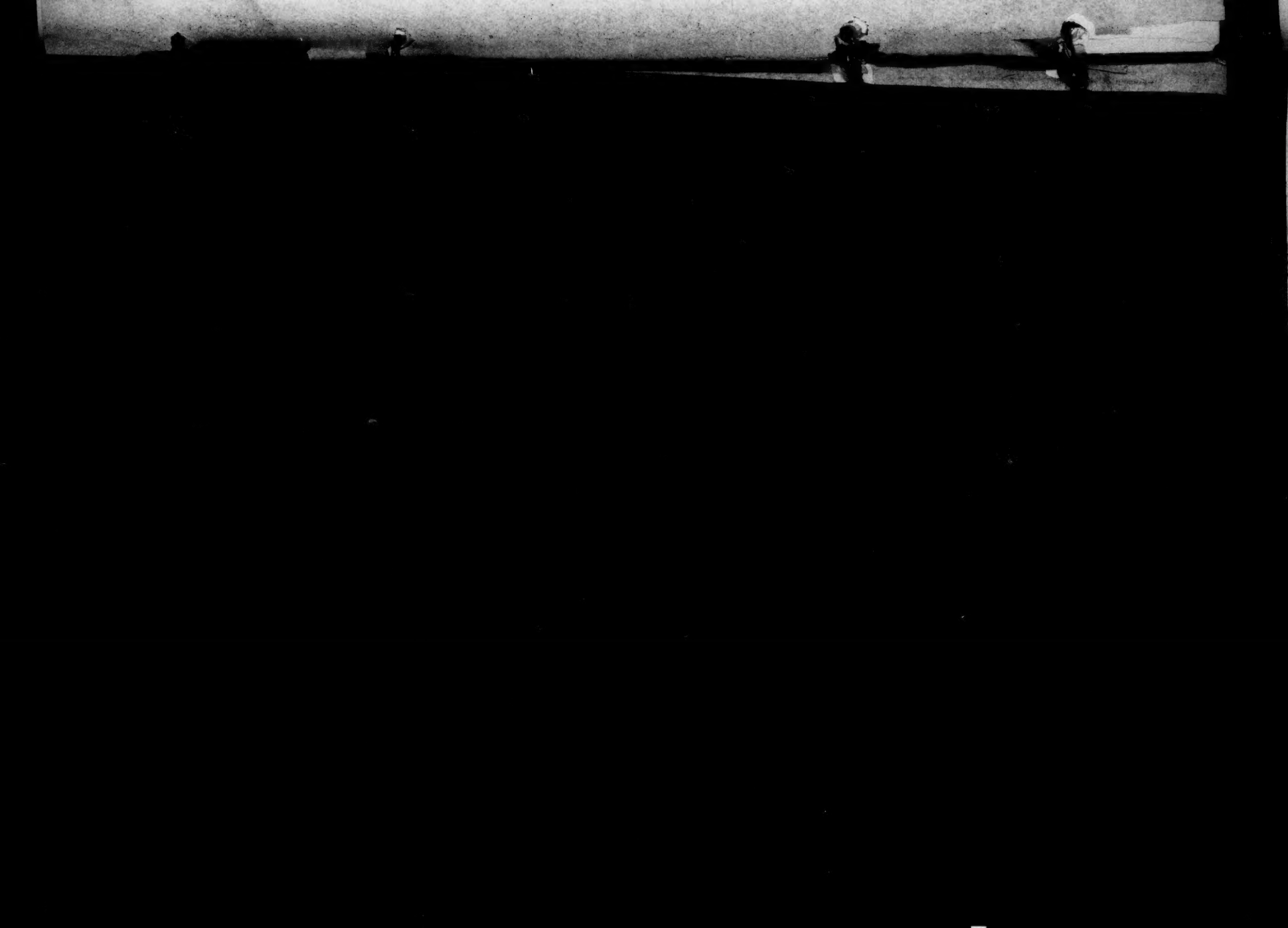
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